LINKING VALUES AND FRAMING THEORIES IN NEW ENERGY DEVELOPMENT: LOW-TEMPERATURE GEOTHERMAL ENERGY (LTGE) IN COASTAL TEXAS

A Dissertation

by

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ABSTRACT

Historically, the lack of broad-scale stakeholder input has led to public resistance and divisive confrontations that have slowed or terminated the development of energy production initiatives. The intent of this research was to study community views of newly proposed technology. By understanding the community's perspective of such technology, efforts can be identified to reduce the probability of such resistance and divisive actions.

Most research concerning geothermal energy has focused on the economic and environmental aspects of developing this energy source; however, in order for any technology to be broadly adopted, it must also be socially acceptable. There has been little research on social perceptions of this new energy source and this study sought to address this knowledge gap by focusing on community perceptions of this and other types of energy development. This study asked what role, if any, values and environmental orientation (as determined by the Schwartz PVQ and the NEP) had in perception of, or preference for, different types of energy. It also examined whether framing new information in a manner congruent with values and/or environmental orientation affected how that message is received. The study was conducted in Matagorda County, Texas and employed a mail survey methodology.

The study indicated that respondents had predominantly positive perceptions about solar, wind, nuclear, and oil and gas energies; negative perceptions regarding coal; and the majority were initially uncertain regarding geothermal energy. However, after

reading a brief description of geothermal energy, 73% were mildly or strongly positive about it. The majority of the survey respondents had high NEP scores (indicating an ecocentric orientation). Along with the expected positive perceptions of wind and solar power, respondents also deemed oil and gas and nuclear power to be acceptable forms of energy. All respondents were found to favor energy systems about which they felt they were knowledgeable. They were less accepting of technology about which they felt they had little knowledge. The study found that framing new information in a manner congruent with values and/or environmental orientation did influence how that message was received. Framing with respect to a person's value type yielded mixed results, while framing based upon environmental orientation produced the most easily interpreted results.

These findings have opened a new window on community-industry collaboration, focused on conflict avoidance rather than conflict resolution. The study concluded with a list of guidelines for pre-development research, which is essential for those attempting to bring new energy development to local communities.

DEDICATION

I would like to dedicate this dissertation to my family. First, for those members who were with me at the beginning of my journey, but ended theirs before being able to celebrate this accomplishment with me: All three of my aunts – Marie (Auntie ReeRee), Esther (Auntie Kavy), Ellen (Auntie Petie), my last paternal uncle, Uncle Joe, my mother-in-law, Ms. Vickers, and most especially, my big brother, David. He called me "Slacker" when I returned to school, saying it was apparent I would rather "just go to school" than actually work. I know they would all be bursting with pride for me at this point, especially David. I sure miss you guys.

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NOMENCLATURE

CCS	Carbon Capture and Storage
CITP	Coastal Impacts Technology Program
DEC	Department of Environmental Conservation
DOE	Department of Energy
DSP	Dominant Social Paradigm
EGS	Enhanced Geothermal Systems
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
ESS	European Social Survey
EVS	European Values Study
GLO	Texas General Land Office
HARC	Houston Advanced Research Center
LTGE	Low-temperature Geothermal Energy
NEP	New Ecological Paradigm
PCA	Principle Components Analysis
PVQ	Portrait Values Questionnaire
SECO	State Energy Conservation Office
STP	South Texas Project
TCEQ	Texas Commission on Environmental Quality
WVS	World Values Survey

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CHAPTER I

INTRODUCTION

Energy Overview

America currently runs predominantly on fossil fuels. According to the National Academy of Sciences (2015), the USA derives 84% of its total energy supply from fossil fuels, including oil, coal, and natural gas. Fossil fuels make up 95% of the U.S. transportation consumption and almost 68% of the electric energy consumption (Institute for Energy Research, 2015). While the USA has an abundant supply of coal and imports less than 2% of its natural gas from outside of North America, almost 66% of its oil is imported (The National Academies, 2013). Reliance on foreign fossil fuels represents a national security challenge. Also, these resources are non-renewable and emit greenhouse gases when burned. Therefore, the USA is searching for alternate cleaner renewable domestic energy sources that will enable the nation to progress towards energy independence. Accordingly, Section 369(i) of the USA Energy Policy Act of 2005 (EPACT05) directed the Department of Energy (DOE) to develop an Unconventional Strategic Fuels Program (U.S. Department of Energy, 2013). In response, the Secretary of Energy convened a Task Force on Strategic Unconventional Fuels, which concluded: “Increasing global oil demand, declining reserve additions, and our increasing reliance on oil and product imports from unstable foreign sources require the Nation to take immediate action to catalyze a domestic unconventional fuels industry” (U.S. Department of Energy, 2010, p. I-i). As recently as August 2015,

President Obama announced the Clean Power Plan to limit carbon dioxide pollution from power plants while transitioning to clean, reliable, and affordable electricity from measures such as renewable energy and greater energy efficiency (The White House, 2015). While energy independence remains elusive, moving towards it will involve greater use of renewable energy resources (Rahman, 2003). One possible domestic source of energy that may help meet future energy needs is geothermal energy.

Although using geothermal energy is a fairly new concept in the United States, this energy source has been around for millennia and has been successfully used for some time in other countries. In 2004, Italy celebrated the 100th anniversary of the first geothermal electric power generation in the Lardarello area. In 1913, after this initial power generation, the first geothermal industrial power plant began operation there and is still in use today (Armstead, 1977). By 2005, 24 countries had installed geothermal generating capacities of 8,912 MW (installed capacities, quoted in MW, is a reference value for power plants and is the plant's target output) (Bertani, 2005). This number increased to over 12,600 MW by 2015 (Bertani, 2015). According to the Union of Concerned Scientists (2015), these geothermal facilities produced enough electricity to supply the annual needs of nearly 6 million U.S. households.

Geothermal resources have been used in North America by human beings for thousands of years (U.S. Department of Energy, 2015a). Whereas geothermal energy and its various uses are not well known by most people in the USA, it has been hailed by industry, scientists, and government as a source of energy that is clean, reliable, and domestic -- and unlike fossil fuels-- emits almost no greenhouse gases (U.S. Department

of Energy, 2015b). Geothermal energy is considered renewable because of the almost unlimited amount of heat generated by the Earth's core; once the heat is removed, the fluid carrying the heat can be reinjected into the ground to be heated again. Whereas geothermal energy may never meet all of the energy demands of the United States, it could be an attractive addition to a diverse energy portfolio.

The primary goal of this research was to address the social dimensions of potential new energy development, with a focus on low-temperature geothermal energy (LTGE), within the boundaries of an environmentally sensitive area along the Texas Gulf Coast. The purpose of such pre-development research was to effectively mitigate social concerns regarding LTGE and avoid potential litigation if the advancement of this energy source was determined to be technically, economically, and environmentally feasible. Minimal research has been done to proactively obtain societal input regarding both LTGE and other forms of energy production. Such input could provide valuable guidelines and learning experiences for both the public and the energy industry. A second goal of this research was to create an approach that parties in the energy development vs. community and quality of life dispute might use as a means of conflict avoidance rather than waiting until conflict resolution was required. As Kreuter et al. (2012) pointed out in their study of energy development in western rangelands, the use of an integrated conceptual framework was critical to systematically address complex issues affecting ecosystems, such as the development of new energy resources in environmentally sensitive areas.

Geothermal Energy

Geothermal energy is literally heat (thermal) from the Earth (geo). The temperature of the Earth varies with depth into the Earth's crust but remains at a fairly steady temperature throughout the year. The various depths and temperatures determine how the heat can be obtained and utilized, allowing the resources to be used on both large and small scales. The most discussed geothermal energy categories are enhanced geothermal systems and low-temperature/co-produced geothermal energy. Discussion of geothermal energy use is often divided into the categories of electricity generation or direct/indirect use.

Enhanced geothermal systems (EGS) utilize the highest temperature resources, those greater than 300°F (150°C). These systems are mainly used to generate electric power and require drilling water or steam wells using advanced technologies similar those used to extract oil or gas. This method of utilizing energy requires geothermal power plants to convert the hydrothermal fluids or steam to electric power. Depending upon whether the fluid is water or steam and its temperature, it is converted to electricity by either dry steam, flash steam, or binary cycle technologies (U.S. Department of Energy, 2015c).

Low-temperature geothermal energy (LTGE) is heat derived from the geothermal fluid in the ground at temperatures of 300°F (~150°C) or less (U.S. Department of Energy, 2015b). This hot geothermal fluid can also be a byproduct of many oil and gas wells and is then known as co-produced geothermal fluid (U.S. Department of Energy, 2015d). In the past, this fluid had been considered a nuisance byproduct, but research is

now being conducted to see if the heat from this co-produced fluid can be utilized as a source of energy (U.S. Department of Energy, 2015d).

LTGE utilization methods involve either direct use of geothermal energy or indirect use via geothermal heat pumps. The direct use method utilizes the heat in the transfer fluid directly, without the use of power plants or pumps. Direct use resources can be piped directly to buildings, greenhouses, or under roads or sidewalks to melt ice and snow.

On the other hand, geothermal heat pumps--also referred to as earth-coupled, ground-source, or water-source heat pumps--exploit the phenomenon that underground temperatures remain fairly steady throughout the year (Renewable Energy World.com, 2016). This technology consists of pipes buried in shallow ground near a building, coupled with a heat exchanger and ductwork in the building. In the winter, the ground's higher temperature is used to heat buildings, and in the summer, the lower temperature is used to cool them. Hot water can also be produced by concentrating this heat via a condenser. This use of geothermal energy is gaining popularity in both commercial and residential buildings. According to the Department of Energy (DOE), approximately 50,000 new geothermal heat pumps are installed in the USA each year (U.S. Department of Energy, 2015e). LTGE may also lend itself to local energy generation through microgrids – autonomous, self-sufficient, distributed systems that use locally available energy sources to power a few buildings, homes or factories (Zolli and Healy, 2012).

Most research concerning geothermal energy has focused on the technical, economic and environmental aspects of developing this energy source. However, in order for this

energy technology to be broadly adopted, it must also be socially acceptable. New forms of energy must be embraced by society in order to become viable. Without societal acceptance, the adoption of new technologies will be unlikely, or unnecessarily slow (Assefa and Frostell, 2007; Huijts et al., 2007; Sauter and Watson, 2007; Wustenhagen et al., 2007). Early stakeholder involvement, including dissemination of fact-based knowledge combined with public input, could lead to greater acceptance of new energy innovations. However, a review of the literature found a lack of research on the social aspects of this alternative form of energy.

Public Involvement in Energy Development Projects

As stated, before new technologies can be adopted, they must also be accepted by society as a viable alternative (Huijts et al., 2007; Sauter and Watson, 2007; Wustenhagen et al., 2007). The U.K. and other countries in Europe have been working on the development of renewable energy sources longer than the USA, and studies show the necessity of involving stakeholders early in the development process (Assefa and Frostell, 2007; Oikonomou et al., 2009; Theodori, 2009; Walker et al., 2007; Walker et al., 2010). In addition, before local stakeholders will consider accepting a new technology, they must be fully informed about both its positive and negative aspects and be given an opportunity to share their concerns with each other and the industry developing those technologies (Assefa and Frostell, 2007; Bradbury et al., 2009; Oikonomou et al., 2009; Theodori, 2009; Walker et al., 2007; Walker et al., 2010).

Examples of Public Involvement in Energy Development

Three recent examples highlight instances where energy-related development projects were postponed or cancelled due to public opposition. These examples include a carbon capture and storage (CCS) project in the Netherlands, natural gas extraction in New York State, and a coal-fired electricity plant in Texas.

Barendrecht, the Netherlands: Carbon Capture and Storage (CCS)

In 2006, Shell began the permitting process for a CO_2 capture and storage demonstration project in two depleted gas fields under the Dutch town of Barendrecht. In 2007, Shell informed the municipal government of the project and in 2008 began to inform the local public. This process is often referred to as "decide, announce, and defend" (Global CCS Institute, 2013). Initially, the local government was opposed and the local citizens were not informed. As time went on, opposition by both local government and local citizens increased. In 2009, an Environmental Impact Assessment (EIA) was approved, but the local opposition became stronger and more organized.

Along with concerns about safety and a possible loss in property values, citizens perceived the decision-making process as unfair and cited a lack of trust in the decision-makers. They also felt that the citizens of Barendrecht and the local government should have had more influence in the decision-making process, and Shell and the national government should have had less (Terwel et al., 2012). The national government and Shell remained in favor of the project, with the Dutch government agreeing to allocate funds for the project once approved. The project began receiving growing national media attention, and--despite local opposition--the national government continued to support

the project. In March of 2009, a national law was implemented that made it easier for the national government to overrule local decisions in matters of national interest. After a debate in the parliament in January 2010, the project's approval appeared to be a certainty. However, in November of 2010, the Dutch government eventually cancelled the project, due in large part to "complete lack of local support" (World Resources Institute, 2010, p.41).

New York State, USA: The Marcellus Shale and Hydraulic Fracturing

In the United States, attention is currently focused on natural gas deposits located in shale basins across the country, which until recently had been too expensive to recover. Some of the larger deposits are the Barnett Shale in northern Texas and the Marcellus Shale in the Northeastern states. The Marcellus Shale is located beneath portions of Pennsylvania, New York, West Virginia, Ohio, and Maryland, and it may contain up to 84 trillion cubic feet (tcf) of technically recoverable natural gas (United States Geological Survey, 2011).

In the Barnett Shale in Texas, which has a long history of oil and gas drilling, land was leased and drilling began quickly and mostly unopposed. In contrast, New York historically had minimal oil and gas production and used primarily conventional techniques. When drilling began in the Marcellus Shale in New York State, using a technique known as hydraulic fracturing, or "fracing," opposition groups quickly formed. These groups included Marcellus Protest, No Frack New York, New York Residents Against Drilling, Frack Alert, and Frack Action. Established groups such as

EarthJustice, EarthWorks, Food and Water Watch, Democracy For America, Greenpeace NYC, and Sierra Club, among others, became involved with the conflict.

Opponents of gas shale development questioned the overall safety of the hydraulic fracturing process and were concerned about the chemicals used in the process, the potential for ground water contamination, air emissions, and the possibility of some of the chemicals not being recovered during the process. As a result, New York State put moratoria in place on hydraulic fracturing in the Marcellus Shale beginning in 2008. Extensions on the moratoria continued, and in March 2013, the New York State Assembly passed legislation that would delay the issuance of certain new natural gas drilling permits until May 2015 (New York State Assembly, 2013). This moratorium allowed time for the New York Department of Environmental Conservation (DEC) to complete its environmental impact statement and issue recommendations. In the meantime, individual municipalities began to pass bans on gas drilling within their borders (Syracuse.com, 2013). Finally, in December 2014, New York's Governor Andrew Cuomo announced that his administration would ban hydraulic fracturing in New York State due to concerns over possible health risks (Kaplan, 2014). Many leases had already been signed at the beginning of this debate, and companies were forced to stop drilling activities for an unspecified length of time. This developed into a costly turn of events for the industry, both monetarily and in terms of public relations.

Matagorda County Texas, USA: Coal-Fired Electricity

In September 2008, the White Stallion Energy Center Project filed an air quality permit application with the Texas Commission on Environmental Quality (TCEQ) for a

coal-fired electric power generating station in Matagorda County, Texas. In 2009, the TCEQ issued a draft air permit for White Stallion without providing a public comment period. When local residents learned about the development, they voiced concerns about the safety of the plant, its water usage in an area already struggling with limited water resources, and harmful air emissions. A local group, the No Coal Coalition, was formed, and national groups, such as the Sierra Club and the Environmental Defense Fund, joined the debate. Despite concerns of the U.S. Environmental Protection Agency (EPA) over the draft air permit, the permit was issued in September 2010 (Texas Commission on Environmental Quality, 2013). The permit was considered by many to be a bait and switch scenario, which occurs when a permit is altered after it is obtained, thus avoiding the public review process required with a permit amendment (No Coal Coalition, 2011). Another concern was that the administrative law judges of the State Office of Administrative Hearings recommended against issuing the air permit. While many public forums were held, White Stallion's owner and CEO declined all invitations to participate (Sierra Club, 2013). Due to growing grassroots opposition and court challenges, White Stallion's inability to secure sufficient water to operate the plant, and failure to meet the requirements of the Electric Reliability Council of Texas (ERCOT), the state's electric grid operator, White Stallion abandoned plans in 2013 to build the Matagorda County coal-fired power plant (No Coal Coalition, 2013). This example is another instance of decide, announce, and defend, in which the local stakeholders were not involved or consulted from the outset, resulting in several years of growing local opposition, legal challenges, and the ultimate abandonment of the plan.

Successful Energy Transition Strategies

Russell et al. (2010) argued the need for greater consideration of the social issues associated with new technologies. They stressed that these interactions with stakeholders must occur alongside technology development, not as an afterthought in trying to overcome barriers. These early interactions should be used to assist in the development and adoption of new technologies.

Several studies highlighted the issue of social acceptance as being a possible limiting factor to the expansion of renewable energies (Huijts et al., 2007; Sauter and Watson, 2007; Wustenhagen et al., 2007). If a new technology is not accepted by society, it may be difficult or impossible to successfully implement. Although renewable energy sources may receive high levels of support from the public, there may still be local resistance to specific projects (Wustenhagen et al., 2007). Therefore, communities should be provided with full and factual information, rather than misperceptions or misrepresentations, when being asked to consider the development of new energy projects within their area.

In an update on renewable energy policy in the U.K., Walker et al. (2007) discussed a trend referred to as community-based localism, a bottom-up model in which energy developers work closely with the community and local stakeholders are empowered to participate in the decision-making process from the very start. This study found less conflict when the community was involved from the beginning of a development project. Projects that led to intense opposition after early public support were due, in part, to "poor public consultation processes by developers" (Walker et al., 2007, p. 71).

Walker et al. (2010) determined that a community approach often leads to greater understanding and support of projects involving community renewable energy. The community approach emphasized the involvement of residents and gave them a voice in the decision-making process on energy development. The community approach could also be applied to the use of local resources, including biomass, waste, and wind. If excess energy was generated, the community would benefit financially by selling the excess back to the grid. In one instance, participants involved in the study likened the community approach to an American barn-raising, because it helps to bring the community together.

Research Overview

This study examined how to proactively and systematically obtain input from stakeholders before new energy sources were developed. This led to the development of a set of guidelines for use in local discussions concerning energy development that focused on conflict avoidance rather than conflict resolution. By following these guidelines and addressing the needs of local stakeholders first, developers of new technology could benefit from a better-informed public, which in turn, could result in a higher degree of acceptance of new development projects.

Purpose of Study

Problem Statement

The fundamental problem addressed in this study was that--when presented with new information about a topic that may be controversial--people often accept or reject this information based upon pre-conceived opinions obtained from various sources. These

sources may include something read on the internet, viewed in a movie, or heard from a third party, and this information may or may not be correct. People often take a position and remain locked into it. The purpose of the study was to determine whether the manner in which new information was presented would affect the individual's willingness to consider factual information in an unbiased way. This study examined whether new information, presented in a manner that was compatible with an individual's value set, would result in a knowledge-based decision rather than a simple and offhand acceptance or rejection of that information. To address this hypothesis, this study examined the relationships between proposed energy development and the participants' support based on their values and self-reported knowledge.

Study Goals and Objectives

The two primary goals of this research were:

(1) To proactively examine the social dimensions of new energy development, specifically low-temperature geothermal energy (LTGE); and

(2) To develop an approach to energy development that focused on conflict avoidance.

In order to achieve these goals, six objectives were addressed, which included the following:

1: Identify respondents' self-reported knowledge, perceptions, and concerns regarding several renewable and non-renewable energy sources.

2: Determine respondents' basic value sets.

3: Establish respondents' environmental attitude orientations.

4: Determine correlation between value sets and environmental orientations.

5: Assess relationship between different ways of framing statements regarding LTGE and respondents' value type (including basic value sets and environmental orientation).

6: Determine if respondents' self-reported knowledge, perceptions and concerns concerning LTGE change with education.

Results derived from satisfying the above objectives were used to compile a set of guidelines that could be used during community discussions concerning energy development.

Theoretical Framework

The purpose of the research presented here was to gain an understanding of the knowledge, perceptions, and fears people have concerning various types of energy. This information was used to create a set of guidelines for proactively informing stakeholders about new renewable energy developments. The theoretical framework for the research integrated two important fields of inquiry--values theory and framing theory.

Values Theory

Since values affect our worldview (Bidwell, 2013; Schwartz, 1992, 2012; Schwartz et al., 2001; Stern et al., 1998), it was important to determine the basic values of the survey respondents and whether particular values have any relationship to respondents' opinions about energy and energy development. Values are the guiding principles or standards for behavior used by individuals and societies. Rokeach (1968, p. 550) defined a value as "an enduring belief that a particular mode of conduct or that a particular end-

state of existence is personally and socially preferable to alternative modes of conduct or end-states of existence." He wrote that values serve as standards that an individual uses to determine actions, attitudes, and behavior, and as a method to judge others. Values also act as determinants of public opinion. He considered two different types of values including instrumental (how to behave) and terminal (end states of existence).

Framing Theory

Framing theory suggests that the way something is presented (the frame) is a dynamic process that can influence the choices people make (Peterson, 2003; Wondolleck, Gray and Bryan, 2003). When people feel that their values or beliefs are being threatened or challenged, they tend to lock into a position, making them less open to different points of view (Wondolleck et al., 2003). Framing techniques can allow people to reconsider locked positions and find a common ground or language. Thus locked positions can be converted to common interests. Common interests within a group can create a commonality from which to constructively approach and manage a conflict.

Combining Values and Framing Theory

This study was designed to link framing theory to the theory of basic values. Combining framing techniques within a basic values context could increase understanding of different views, and developing a commonality (common interests) could enable stakeholders to avoid the conflict that often arises as the result of an us vs. them mentality. This research demonstrated the importance of relating the framing of new energy development issues to the basic value types of the stakeholders.

Understanding a stakeholder's basic values would enable the researcher to utilize framing techniques within the context of the stakeholder's values in order to present new information in a manner that was compatible with those values. Framing issues with respect to a person's values may enhance support of a novel energy concept and could help minimize or avoid conflict at the start of a new project.

General Study Methods

Assefa and Frostell (2007) conducted a case study in Sweden using surveys to assess the public's view of new technologies, and the public's ability to discriminate between different technologies. They used a computer-based sustainability assessment program to determine people's knowledge of different energy technologies, and quantifying indicators of social acceptance. The three indicators used were:

1) Knowledge -What does the public know?

2) Perception - What does the public think? and

3) Fear (synonymous with worry or concern) - What does the public feel?

The conclusions of their study highlighted the importance of addressing social aspects during any decision- making process. Decision makers and developers would benefit by listening and reaching out to the public with information concerning new technologies. They reasoned that public acceptance of a new technology shortens the time between first discussions of the technology and its implementation. Assefa and Frostell (2007) found that it took Swedish citizens 20 years to become less fearful of nuclear energy, even though the technology had changed little during that time. They speculated that this happened either due to increased public education or citizens getting

used to and becoming more familiar with nuclear technology. Accordingly, they considered further nuclear development to be a social rather than a technological challenge. Although the authors admitted that the limited scope of their study did not support generalizations beyond the study group, their results were similar to other studies that supported public involvement early on in the process. They suggested that those trying to develop new energy sources should first aim to increase the public's knowledge "so that technologies win the heart of the public and thereby shorten the time between first discussions and implementation" (Assefa and Frostell, 2007, p.76).

Questionnaire Development

Terwel et al. (2011) asserted that traditional public opinion surveys were not always well-suited for gaining information about subjects that the public knows little about. However, they suggested that surveys can be good tools to assess knowledge level, determine concerns, and understand perceptions. This study conducted a survey utilizing a mail-out questionnaire to measure respondents' social acceptance of various types of energy, including LTGE. Questionnaires are important tools used in the social sciences to determine the opinions and perceptions of specified survey populations regarding natural resources (Adams et al., 2005; Lai and Kreuter, 2012; Martin et al., 2013; Olenick et al., 2005; Sorice et al., 2012; Theodori et al., 2011).

The intent of the questionnaire was to determine participants' perceptions and acceptance of various types of energy. The indicators of social acceptance used in this study were knowledge, perception, and fear, the same as those used by Assefa and Frostell (2007). Along with indicators of social acceptance and basic demographic

questions, the aim of the questionnaire was to determine participants' values. These values were then utilized as variables to frame statements about the benefits of LTGE in different ways. In order to develop the questionnaire, and as a means to understand the issues of energy development in in the study area, key informant interviews and focus groups were conducted.

Survey Administration

After the questionnaire was developed, a mail survey was administered utilizing a modified Dillman method (Dillman 2007). The questionnaires were mailed over the course of several months in 2014 and 2015 to randomly selected addresses within the study area.

Study Area

Matagorda County, Texas, was chosen as the ideal location to conduct this study, given its history of diverse energy development. It was one of the earliest counties in the state to discover oil, and it is one of only two counties in the state of Texas with an operating nuclear power plant (Texas Almanac, 2014-2015). There was also a recent initiative there to develop a coal-fired electric plant, which was eventually terminated due, in part, to lack of local support (Sierra Club, 2013). Also, according to the Matagorda County Economic Development Corporation, Matagorda County "is positioning itself as an 'energy cluster' for conventional and 'green' power generation and energy fuels production" (Matagorda County Economic Development Corporation, 2014).

Along with this diverse history of energy development (and attempted development), an additional reason Matagorda County was chosen for this study was its location in an area shown to have high potential for LTGE production (SECO, 2014). This unique combination of historical, and possible future energy developments may provide the residents of Matagorda County with perspectives on energy that could contribute useful insights for other areas considering new energy development.

Dissertation Organization

This dissertation was organized into five chapters. This first chapter provided an introduction to the topic, some examples as to why this type of research was pertinent, an overview of the objectives of the research, the theoretical frameworks upon which this research was based, and a brief description of the methods used. Table 1 provides a synopsis of each of the remaining four chapters, highlighting the research objectives and the theoretical frameworks that define each chapter.

Table 1. Organizational structure of the three data chapters indicating the objectives addressed and the applicable theoretical framework in each chapter.

Chapter/Title	**Objectives Addressed**	**Theoretical Framework(s)**
II. Value Orientation, Environmental Orientation, and Energy Preference	1, 2, 3, 4	Values Theory
III. Communicative Framing Based on Value Orientation and Environmental Orientation	2, 3, 5	Framing Theory, Values Theory
IV. Knowledge of Energy Types with an Emphasis on Geothermal Energy	1, 2, 3, 6	Framing Theory, Values Theory
V. Summary and Guidelines for Community Dialogues		Framing Theory, Values Theory

CHAPTER II

VALUE ORIENTATION, ENVIRONMENTAL ORIENTATION, AND ENERGY PREFERENCE

Overview

The growth of societies generally requires the development of new energy resources and technologies. The adoption of new technologies requires them to be economically feasible, environmentally sound, and socially acceptable. However, energy development has rarely pro-actively incorporated social acceptability assessments. To address this deficiency, this manuscript describes the results of a 2014-2015 survey of residents of Matagorda County Texas, USA to determine respondents' energy preferences. Additionally the study explored whether value type or environmental orientation metrics could be used as predictors of energy preference, and whether these two sets of metrics are related. Survey participants were asked to answer questions designed to indicate their acceptance of six different types of conventional and alternative energy types. Additionally, two scales were utilized to determine values and environmental orientation. These were the Schwartz Portrait Values Questionnaire (PVQ) and the New Ecological Paradigm (NEP), respectively. This study found little correlation between the two scales, and that value types were not strong predictors of energy preference. However, having a pro-environmental orientation (NEP) was positively correlated with acceptance of wind and solar energy. The strongest positive

determinant of energy acceptance was found to be self-reported knowledge of the energy type.

Introduction

New technologies are developed daily, some of which are adopted and implemented while others never get past the developmental stage, even though they may present a feasible solution for a pressing problem, environmental or otherwise. Past studies have shown that for new technologies to be adopted, they must meet three criteria including: they must be economically feasible, environmentally sound, and socially acceptable (Huijts et al., 2007; Kakoyannis et al., 2001; Sauter and Watson, 2007; Wustenhagen et al., 2007). By contrast, the development and adoption of new energy sources for growing economies have focused primarily on economic feasibility; and to a lesser extent on environmental aspects of the technology, but rarely on social considerations. Without social acceptance, the adoption of new technologies is unlikely or, at least, unnecessarily slow (Assefa and Frostell, 2007). Studies have shown that before local stakeholders will accept a new technology, they must be informed about its positive and negative aspects and given an opportunity to share their concerns with each other and industry (Assefa and Frostell, 2007; Bradbury et al., 2009; Oikonomou et al., 2009; Theodori, 2009; Walker et al., 2007; Walker et al., 2010). These studies all emphasized the benefits of involving local communities from the beginning of development to the actual implementation of new forms of energy.

The purpose of this study was to proactively obtain public input concerning energy development from a County that was intimately familiar with different types of

energy. This was achieved by determining and quantifying indicators of social acceptance of various energy types (oil and gas, nuclear, coal, wind, and solar), including one that has not yet been developed (geothermal). The study participants' value orientations and environmental orientations were also determined through use of the Schwartz Portrait Values Questionnaire (PVQ) and the New Ecological Paradigm (NEP), respectively, in order to determine if either affects energy preference.

Study Area

Matagorda County, Texas, USA, was chosen as the study area for this research. Matagorda County was established in 1836 and has a population of 36,547 (Texas Almanac, 2014). The County is located in an environmentally sensitive area, and is home to wildlife management areas and refuges, coastal prairies, bays, the Gulf of Mexico, and a barrier island (Figure 1).

Matagorda County was selected for this study because it has an atypical history of different forms of energy production. First, it was one of the earliest counties in the state to discover oil, and has had oil and gas production for 100 years (Texas Almanac, 2014-2015). As a result, most of its residents have had some experience with oil and gas production. Second, it is one of only two counties in the state of Texas with an operating nuclear power plant. The South Texas Project (STP) is located near Bay City in Matagorda County, began operations in 1988, and employs 1200 people (STP, 2015). By comparison, the state's other nuclear power plant, Comanche Peak, located in Glen Rose, Somervell County, Texas, came online in 1990, and oil was not discovered in that County until 1978 (Texas Almanac, 2014-2015). Third, there was also a recent initiative

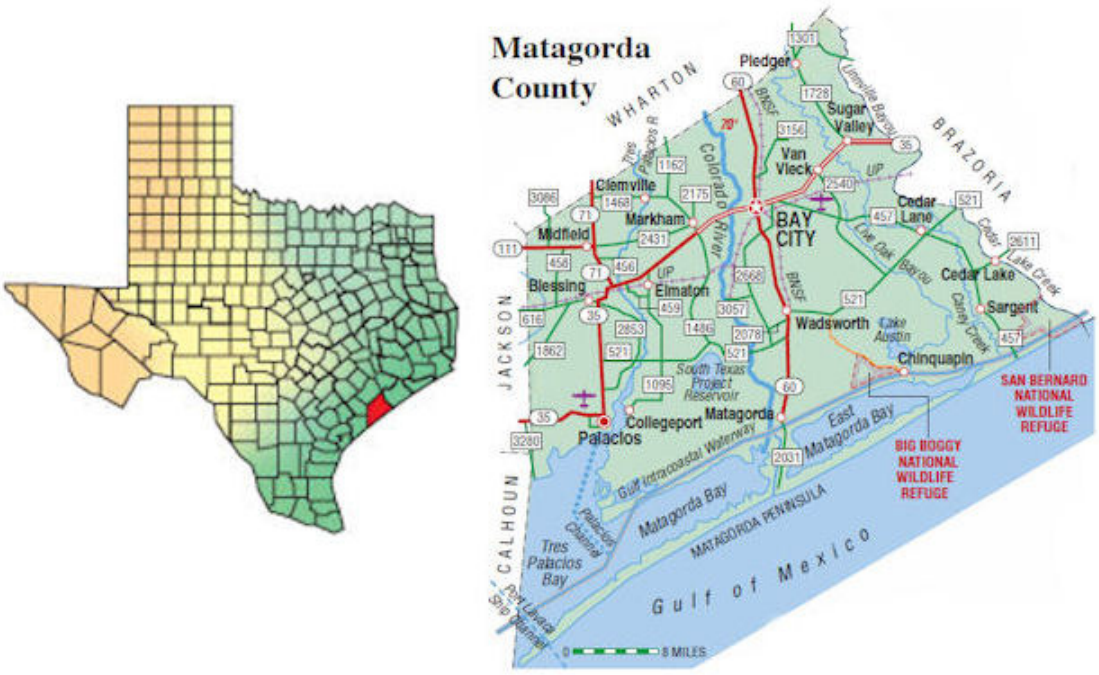

Figure 1. Matagorda County and its location within the state of Texas (Texas Almanac, 2014-2015).

within Matagorda County to develop a coal-fired electric plant. However, this plan was eventually terminated due, in part, to lack of local support (Sierra Club, 2013). Fourth, according to the Matagorda County Economic Development Corporation, Matagorda County "is positioning itself as an 'energy cluster' for conventional and 'green' power generation and energy fuels production" (Matagorda County Economic Development Corporation, 2014).

An additional reason Matagorda County was chosen for this study was its high potential for low-temperature geothermal energy (LTGE) production. The County is located in an area of Texas that has been shown to have potential for LTGE (Figure 2), along with the possible co-production of geothermal energy with existing oil and gas

wells. Hot fluids are often co-produced in oil and gas wells, and while, in the past, these fluids were considered a nuisance byproduct, research is now being done to determine if these co-produced fluids can be utilized as a source of geothermal energy (U.S. Department of Energy, 2013).

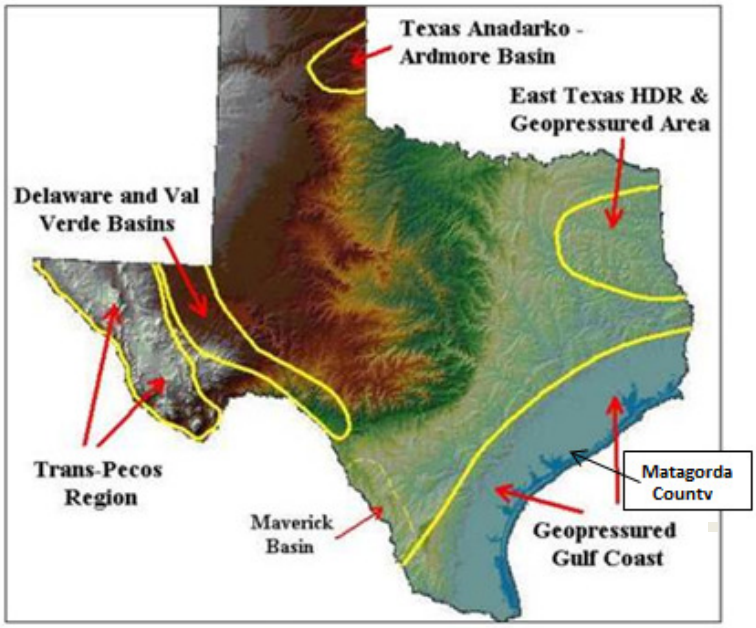

Figure 2. Potential for low-temperature geothermal energy production in Texas (Erdlac, 2006).

In combination, these historical and possible future energy developments may provide the residents of Matagorda County with perspectives on energy that differ from many residents in other counties and that could provide useful insights for other areas considering new energy development. This proactive study provided information to, and obtained input from, local stakeholders before any new energy sources were developed.

By measuring indicators of social acceptance and by addressing any additional concerns of local stakeholders prior to beginning a project, developers of new energy technology could benefit from a better-informed public, which in turn, could result in a higher degree of acceptance.

Literature Review

Indicators of Social Acceptance

Past studies have used different indicators to determine social acceptance of energy or other natural resources-based technologies or decision-making processes. Greenberg (2009) conducted a telephone survey that determined public preferences for seven different energy sources. To explain the variations in these preferences, he used participant variables as indicators of social acceptance including: risk perception, knowledge about nuclear facilities, trust of authority, demographics, values, and location. The survey sample was drawn from randomly located residents across the US, but included some specific locations which were current or future sites for nuclear power plants or nuclear waste management facilities. To determine the values of survey participants, Greenberg asked questions about the importance of religion, and whether or not the participants were active in environmental causes.

Kakoyannis et al. (2001) used a knowledge-based modeling approach to understand the social acceptability of natural resource decision-making processes. They determined that ignoring social acceptability in natural resource management decisions would slow down or prevent implementation of plans resulting from these decision-making processes. The factors used as indicators of social acceptability included context,

including the concept of place attachment, or sense of place; trust, both institutional and individual; risk, or perception of risk; knowledge, especially traditional or local knowledge; and values, wherein they discussed the contrast between utilitarian and biocentric values. They concluded that these values especially shape an individual's worldview, which in turn shapes how problems are defined and limits the extent of acceptable proposed solutions.

Brunson (1992) identified "communication pitfalls" as one of the difficulties of communication between natural resource professionals and the public; specifically, the technical mind-set of professionals often inhibits understanding of the relationship between values and perception. Values give meaning to objects, and these meanings influence perceptions of activities that may affect these objects. In the context of natural resource management, Brunson (1992) highlighted substantial differences in the preferred use of a natural resource according to the dominance of either a spiritualist or a utilitarian value of the user. In order to provide effective natural resource management, he stressed that the reality of different value systems must be acknowledged.

Assefa and Frostell's (2007) assessment of the public's view of new technologies used the following indicators to quantify social acceptance: 1) Knowledge -What does the public know?; 2) Perception - What does the public think?; and 3) Fear (synonymous with worry or concern) - What does the public feel? Consistent with the previously discussed studies, this study highlighted the importance of addressing social aspects at the beginning of any decision-making process. While discussing the fact that it took Swedish citizens 20 years to become less fearful of nuclear energy, even though the

technology had changed little during that time, Assefa and Frostell (2007) speculated that this happened due to either the citizens gaining more knowledge or, perhaps, just getting used to the idea of nuclear technology. Accordingly, they considered further nuclear development to be a social rather than a technological challenge, and suggested that those trying to develop new energy sources should first try to increase the public's knowledge "so that technologies win the heart of the public and thereby shorten the time between first discussions and implementation" (Assefa and Frostell, 2007, p.76).

Values

Values are the guiding principles or standards for behavior used by individuals and societies. Rokeach (1968, p. 550) defined a value as "an enduring belief that a particular mode of conduct or that a particular end-state of existence is personally and socially preferable to alternative modes of conduct or end-states of existence." He postulated that values serve as standards used by individuals to determine their own attitudes, behavior, and actions, and also to judge those of others. Values also act as determinants of public opinion. Schwartz (1992, p.1) concurred that values are critical motivators of behavior and defined them as "deeply rooted, abstract motivations that guide, justify or explain attitudes, norms, opinions and actions." Schwartz (2012) later developed a theory of basic human values, and defined six main features of *all* values:

(1) Values are beliefs.

(2) Values refer to desirable goals.

(3) Values transcend specific actions and situations.

(4) Values serve as standards or criteria.

(5) Values are ordered by importance.

(6) The *relative* importance of multiple values to one another guides action.

Schwartz (2012) defined 10 culturally universal value constructs and determined that these had four higher order value types (Table 2). (Note that the higher order value types of Self-Enhancement and Openness to Change both share elements of hedonism.)

Table 2. Higher order value types and defining goals of each (Schwartz, 2012).

4 Higher Order Value Types	**10 Basic Human Values (Motivational Values) and their Defining Goals**
Self-Enhancement	**Power** - Social status and prestige, control or dominance over people and resources
	Achievement - Personal success through demonstrating competence according to social standards
	Hedonism - Pleasure and sensuous gratification for oneself
Openness to Change	**Hedonism** - Pleasure and sensuous gratification for oneself
	Stimulation - Excitement, novelty, and challenge in life
	Self-Direction - Independent thought and action, choosing, creating, and exploring
Self-Transcendence	**Universalism** - Understanding, appreciation, tolerance and protection for the welfare of *all* people and of nature
	Benevolence - Preservation and enhancement of the welfare of people with whom one is in frequent personal contact
Conservation	**Tradition** - Respect, commitment and acceptance of the customs and ideas that traditional culture or religion provides
	Conformity - The restraint of actions, inclinations, and impulses that are likely to upset or harm others and violate social expectations or norms
	Security - Safety, harmony and stability of society, relationships, and self

Schwartz (2012) modeled these 10 motivational values in a concentric pattern. Compatible values were in close proximity to each other and conflicting values were on

opposite sides, similar to a color wheel. The closer the values were on the continuum, the more similar their underlying motivations (Davidov et al., 2008, Figure 3). To test his theory, Schwartz administered questionnaires to residents in over 20 countries (Schwartz, 1992) and determined that the meaning of the value types (and most of the single values that constituted them) were reasonably equivalent within and across cultures.

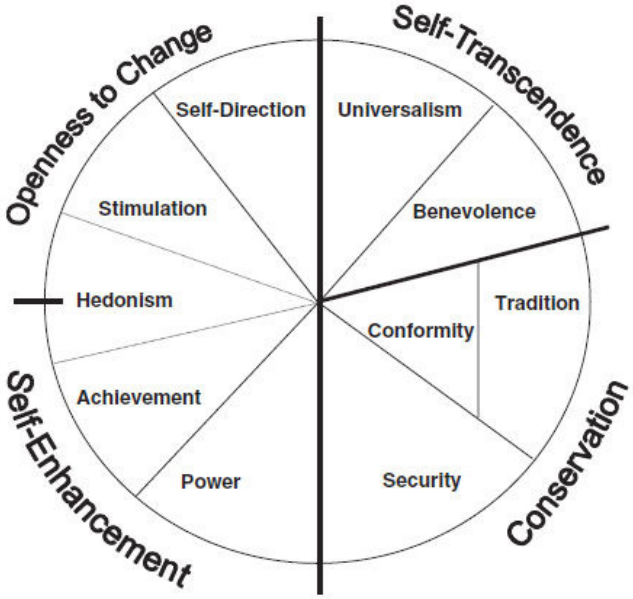

Figure 3. Continuum of motivational values (Schwartz, 2012).

Schwartz then condensed the four higher order value types into two basic dimensions (Figure 4). They were:

1. Self-protective versus self-expansive values, i.e. preservation of order and resistance to change versus independence and growth.

2. Personal versus social focus, i.e., personal self-interests versus pro-social and pro-environmental interests

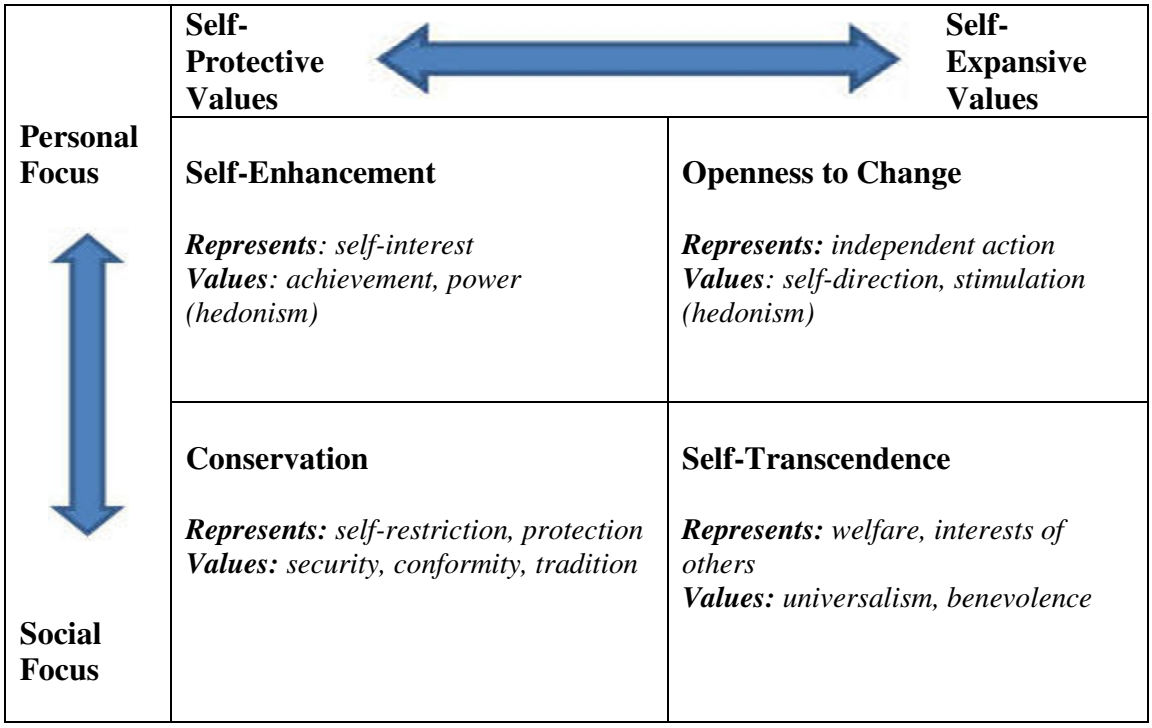

Figure 4. Dynamic underpinnings of the universal value structure (Schwartz, 2012).

The opposing values for these two dimensions are Self-Enhancement vs. Self-Transcendence (self-protective vs self-expansive values), and Openness to Change vs. Conservation (personal vs. social focus). Self-Enhancement represents self-interest, whereas the values of Self-Transcendence represent concern for the welfare and interests of others and the environment. Openness to Change represents independent action and opposes Conservation, which represents self-restriction and protection of self and the status quo.

Environmental attitudes are also a type of value. Dietz et al. (2005) asserted that values were the bases for environmental concern, and influence how individuals think and behave towards the environment. Dunlap and Van Liere (1978) proposed that environmental problems were tied to traditional values, and that society's desire to grow and prosper came at the expense of environmental degradation. Stern et al. (1995) theorized that certain values were associated with willingness to take pro-environmental action.

Two scales -- the Schwartz Personal Values Questionnaire (PVQ) and Dunlap and Van Liere's New Ecological Paradigm (NEP) -- were used in this study to determine value orientations of Matagorda respondents. These two scales are described below.

Schwartz Portrait Values Questionnaire (PVQ)

Schwartz developed the Portrait Values Questionnaire (PVQ) as a research tool that could be applied to diverse populations, including those with little or no formal education (European Social Survey, 2014; Schwartz et al., 2001; Schwartz, 2012). The PVQ consists of statements describing a person. Participants are asked to read each "portrait" and decide how much the person in the portrait was like them ("How much like you is this person?"). There are several versions of the PVQ, which differ in the number of included items and the number of basic values selected to address specific research questions. This study utilized a 34-item PVQ (S. Schwartz, personal communication, June 15, 2014).

New Ecological Paradigm (NEP) Scale

Dunlap and Van Liere (1978) developed the New Environmental Paradigm (NEP), in which humans were an integral part of nature and all of nature has intrinsic value. This was in contrast to the then prevalent Dominant Social Paradigm (DSP), in which humans are viewed as superior to all other species and the natural environment is theirs to use as they please. Dunlap et al. (2000) later presented a revised NEP that they named the New *Ecological* Paradigm (also NEP). This new scale was wider ranging, offered a better balance between pro- and anti-NEP statements, and revised outdated and sexist terminology. The NEP consists of 15 items that include categories such as the balance of nature and human interaction with the environment. A high score on the NEP indicates an endorsement of a more environmentally conscious worldview, and a lower score reflects an endorsement of the DSP worldview. For this study, the results of the NEP were referred to as *environmental orientation*.

Some studies showed relationships between values, and both environmental behavior and environmental orientation (Grob, 1995; Karp, 1996; Schultz and Zelezny, 1999). As stated earlier, the population of this study had an atypical history of energy development, and while they have an on-going positive relationship with a nuclear plant, they were also concerned about the environmental sensitivity of their County. Due to these factors, this study did not assume that values and environmental orientation were related constructs. After each was measured, correlation tests were used to examine the relationship between the two constructs within the Matagorda population.

Questions and Hypotheses

Previous research found positive relationships between the self-expansive values and environmental orientation (as measured by the NEP), and negative relationships between NEP and the self-protective values (Bidwell, 2013; Karp, 1996; Toke and Strachan, 2006; Schultz and Zelezny, 1999). Due to Matagorda County residents' atypical relationship with energy development, this study did not assume this correlation, but asked the question: Is value orientation related to environmental orientation? The associated hypothesis was:

H1: High NEP scores are positively associated with self-expansive values (Openness to Change and Self-Transcendence values) and negatively associated with self-protective values (Self-Enhancement and Conservation).

The second question asked by this study was: Does value orientation affect perception of and/or preference for various energy types (including both conventional and renewable energies)? Previous research indicated that Conservation values were positively associated with nuclear energy preference and negatively associated with wind energy (Bidwell, 2013; Whitfield et al., 2009), while other studies found a negative correlation between Self-Enhancement values and environmental concern (Karp, 1996; Stern et al., 1995).Conservation and Self-Enhancement values are both self-protective values, with Conservation values motivated by tradition, or preserving the status quo. Comparatively, Self-Enhancement values are motivated by power, or dominance over resources.

Renewable energy sources are thought to have less impact on both people and the environment than conventional energy sources, and wind energy has even become a symbol of environmentalism (Toke and Strachan, 2006). Previous research found a positive relationship between the values of Openness to Change and Self-Transcendence and wind energy, and a negative relationship between these values and nuclear energy (Bidwell, 2013; Toke and Strachan, 2006; Whitfield et al., 2009). Openness to Change and Self-Transcendence are both self-expansive values. Openness to Change values are motivated by change and independent action. Self-Transcendence values are motivated by concern for others and the environment.

Two hypotheses were tested to address this question concerning these relationships with Matagorda County residents. One tested associations between value type and conventional energy sources. The other tested associations between value type and renewable energy sources:

H2: Strong Self-Enhancement and Conservation values (i.e., self-protective values) will be more positively associated with acceptance of conventional energy sources (oil and gas, nuclear, and coal) and negatively associated with renewable energy sources.

H3: Strong Openness to Change and Self-Transcendence values (i.e., self-expansive values) will be more positively associated with acceptance of renewable energy sources (wind, solar, and geothermal) and negatively associated with conventional energy sources.

The third question this study sought to answer was: Does environmental orientation affect perception of and/or preference for various energy types (including both conventional and renewable energies)? Previous studies found a positive relationship between high NEP scores and support for wind energy, and between low NEP scores and support for nuclear energy (Bidwell, 2013; Whitfield et al., 2009). Renewable energies, such as solar and wind energy are considered more environmentally friendly than conventional energy (Toke and Strachan, 2006). A fourth hypothesis, based on this previous research was:

H4: High NEP scores will be positively associated with acceptance of renewable energy sources and negatively associated with acceptance of conventional energy sources.

Methods

Mail Survey

In order to develop a questionnaire that addressed the issues of energy development among Matagorda County residents, key informant interviews and focus groups were conducted, methods commonly used to understand community concerns (Sangaramoorthy, et al. 2016; Theodori, et al. 2009). A questionnaire (Appendix A) was then developed to explore the opinions of a wide range of residents about energy production alternatives and the future development of energy production facilities in Matagorda County, and to assess their values and environmental orientations. Data were collected through a mail survey of randomly selected Matagorda County residents who were age 18 or older. The population of Matagorda County is approximately 36,000

(Texas Almanac, 2014-2015). Based on this figure, the required minimum sample size of respondents needed to achieve a sample error of 5% with a confidence level of 95% was determined to be 380. This required minimum sample size was then doubled to offset nonresponse bias. As a result, survey questionnaires were mailed to 800 randomly selected addresses in Matagorda County, obtained from Survey Sampling International.

The survey was initiated in August 2014 and consisted of five mailings: pre-survey notification letter (day 1); survey questionnaire with a cover letter (day 7); thank you/reminder postcard (day 14); replacement questionnaire with letter for non-respondents (day 28); and a final thank you/reminder card (day 42).

Due to the return of almost 21% of the mailings as a result of bad addresses, along with a low response rate, it was decided to increase the survey sample by 500 residents (to a total sample size of 1300), following the identical research protocol. The second round of mailings was initiated in November 2014, using the same mailing protocol. However, due to year-end holidays, the timing between mail-outs differed slightly; the pre-survey notification letter went out on day 1; the survey questionnaire with cover letter went out on day 14; the first thank you/reminder postcard went out on day 21; a replacement questionnaire with a second cover letter for non-respondents went out on day 46; and the final thank you/ reminder card went out on day 61.

Questionnaire

Indicators of Social Acceptance

The questionnaire (Appendix A) first explored participants' acceptance of various types of energy. Like Assefa and Frostell (2007), the indicators of social

acceptance used in this study were knowledge (self-described), perceptions, and concerns or fears. Participants were asked the same questions about six different types of energy including both conventional (oil and gas, nuclear, and coal) and alternative or renewable energy types (wind, solar, and geothermal) (Table 3). After reading the statements about each type of energy, participants were asked to use a 5-point response scale to indicate the extent to which they disagreed or agreed with each the statement (1 = *Strongly Disagree* … 5 = *Strongly Agree*). Energy preferences, or perceptions, of the respondents were determined by quantifying the four indicators of social acceptance. Self-reported knowledge was quantified separately from the other three statements since respondents might consider themselves to be highly knowledgeable about an energy type, but still rank it negatively, which would affect the mean scores if all four statements were averaged.

Table 3. Indicators of social acceptance survey questions.

Survey Questions*	**Indicator of Social Acceptance**
I consider myself knowledgeable about the "…"* industry.	Self-described Knowledge
I think the "…" industry is/could be a positive asset to Matagorda County.	Perception
I do not worry about the safety of "…" energy development in Matagorda County.	Fear – Worry
I believe that "…" is not harmful to the environment	Fear – Concern

* "…" was replaced with "oil and gas," "nuclear," "coal," "wind," "solar," or "geothermal."

Values and Environmental Orientation

Respondents' values were then determined using both the Schwartz Portrait Values Questionnaire (PVQ), to characterize the basic value types to which respondents assigned their highest priorities, and the New Ecological Paradigm (NEP), to establish respondents' environmental orientations. Two scales were used in order to determine which one was more indicative of perceptions regarding energy development, and if either was more amenable to the use of framing techniques. If correlated, this would offer flexibility for the determination of value sets of stakeholders.

Schwartz Portrait Values Questionnaire (PVQ)

The Schwartz PVQ consisted of 34 brief statements, each describing a person. Participants were asked to read each description and think about *"How much like you is this person"* and then to choose from one of six responses ranging from *Not Like Me At All* to *Very Much Like Me*. Scores were calculated for the four higher level value types depicted in Figure 4 according to a coding key (S. Schwartz, personal communication, June 15, 2014). A principle components analysis (PCA) indicated that these 34 items and their four value types were internally consistent and produced Cronbach's alphas ranged from .79 to .82. These four value types were used in determining respondents' acceptance of different types of energy.

New Ecological Paradigm (NEP)

The NEP (Dunlap et al., 2000) consisted of 15 statements that participants were asked to read and then to express their opinion about using a 5-point response scale (0 = Unsure, 1 = *Strongly Disagree* to 4 = *Strongly Agree*). A principle components analysis

(PCA) produced a Cronbach's alpha of .79 indicating the 15 items were internally consistent. The overall NEP score for each respondent was calculated by scoring each of the 15 response items according to the response choice, and then averaging the 15 scores. Even numbered statements were anti-NEP statements and, therefore, were reverse coded. Higher NEP scores indicated a more environmentally conscious worldview ("pro-NEP") and lower scores reflected endorsement of the DSP worldview ("anti-NEP"). The means were categorized as: pro-NEP (mean score > 2), anti-NEP (*mean score* > 0 and ≤ 2) and Unsure (mean score = 0).

Data Analysis

Survey data were entered into a Microsoft Excel spreadsheet and analyzed using STATA 13.1 (StataCorp, 2015). Statistical analyses included descriptive statistics for demographic data, frequency distributions, and correlation testing that determined any relationship between values and energy choices. Since more than one independent variable was involved, multiple regression tests were run to determine whether certain independent variables (self-reported knowledge, working in the industry, having that type of energy on property) predicted acceptance or preference for certain energy types.

Results

Of the total 1300 questionnaires mailed out, 278 were returned as undeliverable, resulting in an effective sample size of 1022 Matagorda County residents. Of these, 316 responded giving a raw response rate of 31%. However, 42 of the returned questionnaires were unusable for various reasons including, addressee deceased, poor eyesight, age, or respondent chose not to complete questionnaire. This left 274

completed questionnaires and a useable response rate of 27%. This response resulted in a sampling error of 6% with a confidence level of 95%. Time and budgetary constraints prevented the inclusion of a follow-up non-response bias survey and analysis. This limited the extrapolative power of the research results to the whole population, but did offer an initial explorative examination of research objectives and hypotheses.

Respondent Profiles

The length of time respondents lived in Matagorda County ranged widely from two months to 86 years with a median value of 32 years and a mean value of 34 years (SD = 21.73). Respondents were predominantly male (61.5%), ranging in age from 22 to 91 with a mean age of 59 (SD = 14.4), and 86% of them owned property in Matagorda County. The majority (83.5%) were White, followed by Hispanic (9.4%). The majority had some college or were college graduates (29.0% and 27.4%, respectively). Forty percent were employed full-time, 33.2% were retired, and 9% were self-employed. Income ranged from < $15,000 to > $100,000 (34.4%). When asked if respondents or family members worked in the various industries, results were: oil and gas - 91 (34%), nuclear - 90 (33%), wind - 7 (3%) and coal 4 (2%). No one worked in the solar industry. Geothermal was not a category since it currently does not exist within the County. Eighteen respondents (7%) indicated they had some form of alternative or renewable energy generation on their property in Matagorda County or elsewhere, including solar, wind, and one heat pump.

Measuring Indicators of Social Acceptance

The first section of the questionnaire asked survey participants about their knowledge, perceptions, fears, and concerns regarding six types of energy (Table 3). Respondents' energy preferences were based upon these indicators of social acceptance. Response frequencies for each energy set were tabulated into negative perceptions (*Strongly Disagree* and *Mildly Disagree*), unsure, and positive perceptions (*Mildly Agree* and *Strongly Agree*). Self-reported knowledge was analyzed separately from the other three statements.

Most respondents had positive perceptions for solar (75%), wind (73%), nuclear (66%), and oil and gas (63%) energy. In contrast, coal energy (52%) was perceived as negative, while respondents were predominantly unsure (55%) about geothermal energy (Table 4). Over half of the respondents considered themselves knowledgeable about oil and gas (71%), nuclear (70%), wind (61%) and solar energy (57%), while 49% considered themselves knowledgeable about coal and 30% about geothermal energy (Table 5).

Table 4. Frequency of respondent perceptions of different energy types.

Energy Type	Positive	Negative	Unsure
Solar	***.75***	.08	.17
Wind	***.73***	.11	.16
Nuclear	***.66***	.21	.13
Oil & Gas	***.63***	.24	.13
Coal	.26	***.52***	.22
Geothermal	.35	.10	***.55***

Table 5. Frequency of respondents' self-described knowledge about different energy types.

Energy Type *"I consider myself knowledgeable about…."*	Strongly or Mildly Disagree	Unsure	Mildly or Strongly Agree
Oil & Gas	.18	.11	***.71***
Nuclear	.19	.11	***.70***
Wind	.23	.16	***.61***
Solar	.25	.18	***.57***
Coal	.35	.16	***.49***
Geothermal	***.46***	.24	.30

Determining Value Types and Environmental Orientation

Responses to the 34 items of the PVQ were summarized in Table 6. The frequency of how many respondents checked each category is shown along with the median and mean scores for each statement. Each of the 34 statements addressed one of the ten basic values, as shown in Table 2. The scores for each of the ten basic values were computed by combining the means of the items that address each value. By combining the single values making up each value type, "reasonably reliable indexes of the priority attributed to that value type" can be achieved (Schwartz, 1994, p.42).

Motivational differences between value types are continuous rather than discrete, and may overlap other boundaries of adjacent value types (Davidov et al., 2008) (Figure 3). The PVQ scale indicated where on the continuum of the four higher-level value types (Self-Enhancement, Openness to Change, Self-Transcendence, and Conservation) an individual assigns the highest priorities. (It should be noted as a reminder that the value set labeled "Conservation" has to do with security, conformity and tradition, and not

Table 6. Response types and frequencies to PVQ statements with median and mean score comparisons.

HOW MUCH LIKE YOU IS THIS PERSON?	N	Not like me at all	Not like me	A little like me	Moderately like me	Like me	Very much like me	Median score	Mean score (std. dev.)
Openness to Change									
2. It is important to him or her to have a good time.	265	1.51	11.32	23.40	24.15	23.02	16.6	4	4.06 (1.31)
6. It is important to him or her always to look for different things to do.	266	0.75	10.90	19.17	20.68	27.82	20.68	4	4.26 (1.32)
10. It is important to him or her to make his/her own decisions about his/her life.	265	0.00	0.75	4.15	7.17	36.23	51.70	6	5.34 (.84)
13. It is important to him or her to develop his/her own opinions.	266	0.00	1.13	3.38	12.41	36.47	46.62	5	5.24 (.88)
21. It is important to him or her to figure things out him/herself.	268	0.75	2.24	9.70	16.42	41.42	29.48	5	4.84 (1.07)
24. It is important to him or her to have all sorts of new experiences.	269	2.60	13.01	20.82	26.77	23.42	13.38	4	3.96 (1.32)
27. It is important to him or her to take advantage of every opportunity to have fun.	269	7.43	23.79	27.51	17.10	14.50	9.67	3	3.36 (1.43)
33. It is important to him or her to be free to choose what he/she does by him/herself.	269	0.37	1.86	7.43	11.52	36.80	42.01	5	5.09 (1.03)
TOTAL									**4.51 (.75)**
Self-Transcendence									
4. It is important to him or her that the weak and vulnerable in society be protected.	266	1.50	6.39	16.54	23.68	29.70	22.18	5	4.40 (1.26)
5. It is important to him or her to care for nature.	266	0.00	0.75	9.02	15.41	33.83	40.98	5	5.05 (1.00)
7. It is important to him or her to take care of people he/she is close to.	266	0.00	0.00	1.88	5.26	31.20	61.65	6	5.53 (.68)
9. It is important to him or her to be tolerant toward all kinds of people and groups.	266	5.64	4.89	18.05	17.67	31.95	21.80	5	4.31 (1.41)

Table 6 continued

HOW MUCH LIKE YOU IS THIS PERSON?	N	Not like me at all	Not like me	A little like me	Moderately like me	Like me	Very much like me	Median score	Mean score (std. dev.)
12. It is important to him or her that people he/she knows have full confidence in him/her.	266	0.38	1.13	9.02	16.17	37.97	35.34	5	4.96 (1.02)
14. It is very important to him or her to help the people dear to him/her.	264	0.00	0.76	1.14	6.44	30.30	61.36	6	5.50 (.73)
16. It is important to him or her to be a dependable and trustworthy friend.	264	0.38	0.38	1.52	3.79	32.58	61.36	6	5.52 (.73)
26. It is important to him or her to protect the natural environment from destruction or pollution.	269	0.37	1.86	11.52	15.99	36.06	34.20	5	4.88 (1.09)
31. It is important to him or her that everyone be treated justly, even people /she doesn't know.	267	0.75	0.75	8.99	9.74	38.95	40.82	5	5.08 (1.02)
34. It is important to him or her to accept people even when he/she disagrees with them.	269	1.86	7.06	13.38	18.59	40.52	18.59	5	4.45 (1.24)
TOTAL									**4.97 (.65)**
Conservation									
1. It is important to him or her that his/her country is secure and stable.	266	1.13	0.75	3.38	6.39	29.32	59.02	6	5.39 (.94)
3. It is important to him or her to avoid upsetting other people.	265	3.02	10.19	22.26	21.89	23.77	18.87	4	4.10 (1.38)
11. It is important to him or her to maintain traditional values and ways of thinking.	265	1.13	3.77	10.94	12.08	38.11	33.96	5	4.84 (1.18)
15. It is important to him or her to be personally safe and secure.	263	0.00	1.52	3.42	6.46	31.56	57.03	6	5.39 (.87)
18. It is important to him or her to follow rules even when no-one is watching.	266	1.88	2.63	6.39	10.90	33.46	44.74	5	5.06 (1.16)

Table 6 continued

HOW MUCH LIKE YOU IS THIS PERSON?	N	Not like me at all	Not like me	A little like me	Moderately like me	Like me	Very much like me	Median score	Mean score (std. dev.)
20. It is important to him or her to follow his/her family's customs or the customs of a religion.	266	4.51	10.90	14.29	19.17	28.57	22.56	5	4.24 (1.46)
23. It is important to him or her to obey all the laws.	269	0.37	0.74	9.29	11.15	38.29	40.15	5	5.07 (1.01)
29. It is important to him or her that his/her country protect itself against all threats.	268	0.37	0.75	4.48	7.09	27.99	59.33	6	5.40 (.90)
30. It is important to him or her never to make other people angry.	269	5.95	19.70	24.16	20.07	20.07	10.04	4	3.59 (1.42)
32. It is important to him or her to avoid anything dangerous.	266	3.01	18.42	19.92	16.54	23.31	18.80	4	3.95 (1.48)
TOTAL									**4.70 (.75)**
Self-Enhancement									
8. It is important to him or her to have the power that money can bring.	266	12.78	31.20	13.91	19.17	15.04	7.89	3	3.16 (1.52)
17. It is important to him or her to have the power to make people do what he/she wants.	266	25.94	40.23	14.66	8.65	7.14	3.38	2	2.41 (1.33)
19. It is important to him or her to be very successful.	268	1.49	6.34	15.67	23.88	31.72	20.90	5	4.41 (1.24)
22. It is important to him or her to be the one who tells others what to do.	269	10.78	36.06	25.28	17.47	7.43	2.97	3	2.84 (1.23)
25. It is important to him or her to own expensive things that show his/her wealth.	268	38.81	45.52	5.97	5.97	2.24	1.49	2	1.92 (1.06)
28. It is important to him or her that people recognize what he/she achieves.	269	10.78	30.86	26.02	15.24	10.41	6.69	3	3.04 (1.38)
TOTAL									**2.95 (.95)**

environmental conservation.) The results of the PVQ were then used to determine whether relationships existed between values and environmental orientation, and between values and energy preferences.

Table 7. Response types and frequencies to NEP statements with median and mean score comparisons.

Statement	**N**	**Strongly Disagree**	**Mildly Disagree**	**Unsure**	**Mildly Agree**	**Strongly Agree**	**Median score**	**Mean score (std. dev.)**
1. We are approaching the limit of the number of people the earth can support.	268	7.09	16.42	21.27	36.94	18.28	3	2.24 (1.40)
2. Humans have the right to modify the natural environment to suit their needs.	267	10.11	31.84	11.99	28.46	17.60	2	2.30 (1.22)
3. When humans interfere with nature it often produces disastrous consequences.	268	5.22	14.18	11.57	44.40	24.63	3	2.65 (1.23)
4. Human ingenuity will insure that we do NOT make the earth unlivable.	266	10.90	28.57	28.20	21.43	10.90	2	1.76 (1.36)
5. Humans are severely abusing the environment.	265	9.43	16.98	7.17	34.34	32.08	3	2.75 (1.21)
6. The earth has plenty of natural resources if we just learn how to develop them.	268	36.57	41.42	7.84	9.70	4.48	2	1.66 (.92)
7. Plants and animals have as much right as humans to exist.	267	6.37	11.99	8.61	27.72	45.32	3	2.95 (1.27)
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.	268	5.60	22.39	21.64	27.61	22.76	4	2.24 (1.43)
9. Despite our special abilities humans are still subject to the laws of nature.	267	1.87	1.87	5.62	36.70	53.93	4	3.31 (1.02)
10. The so-called “ecological crisis” facing humankind has been greatly exaggerated.	266	16.54	24.81	25.19	17.29	16.17	2	1.83 (1.40)
11. The earth is like a spaceship with very limited room and resources.	266	10.53	22.93	16.54	34.59	15.41	2	2.22 (1.30)
12. Humans were meant to rule over the rest of nature.	268	20.90	23.51	14.55	22.76	18.	2	2.09 (1.32)
13. The balance of nature is very delicate and easily upset.	267	3.75	13.48	13.48	41.57	27.72	3	2.66 (1.29)
14. Humans will eventually learn enough about how nature works to be able to control it.	265	6.04	19.62	24.53	29.81	20.00	2	2.15 (1.46)
15. If things continue on their present course, we will soon experience a major ecological catastrophe.	267	10.11	13.48	25.47	28.84	22.10	3	2.12 (1.51)

Table 7 lists the NEP statements and frequency distribution of responses to each category. Responses were then categorized as "pro-NEP" and "anti-NEP" scores. The results indicated that 70% of this population had pro-NEP scores compared to 30% who had anti-NEP scores, and one person scored "unsure" (Table 8).

Table 8. Frequency of Pro-NEP and Anti-NEP

NEP	**Frequency**	**Percent**
Pro-NEP	212	69.74
Anti-NEP	92	30.26
Total	**304**	**100**

Relationships Between Values and Environmental Orientation

After determining scores for both value types and environmental orientation, an analysis was done to determine the correlation between high NEP scores and each of the four value types within this population. This analysis addressed the first question asked in this study as to whether environmental orientation was related to value type, and the associated hypothesis: *H1: High NEP scores will be positively associated with self-expansive values (Openness to Change and Self-Transcendence values) and negatively associated with self-protective values (Self-Enhancement and Conservation).*

It was determined that there was a positive relationship ($p < 0.001$) between Self-Transcendence and NEP and a negative relationship between Conservation and NEP ($p = 0.001$) (Table 9). These results only partially supported H1. The values with a social focus (which regulate how one relates socially to others, i.e., Conservation and Self-

Table 9. Correlation between NEP and the 4 value types (N = 267).

Statistic	Openness to Change	Self-Transcendence	Self-Enhancement	Conservation
Coefficient	0.03	***0.37***	-0.06	***-0.24***
p-value	0.68	***<0.001***	0.27	***0.001***

Transcendence) were related to environmental orientation, as opposed to the self-expansive values (Figure 4). Those values that regulated how one expresses personal interests (Self-Enhancement and Openness to Change) were found to have no association with environmental orientation in this population.

The second and third hypotheses addressed the question as to whether value orientation affected perception of and/or preference for energy type: *H2: Strong Self-Enhancement and Conservation values (i.e., self-protective values) will be more positively associated with acceptance of conventional energy sources (oil and gas, nuclear, and coal) and negatively associated with renewable energy sources,* and *H3: Strong Openness to Change and Self-Transcendence values (i.e., self-expansive values) will be more positively associated with acceptance of renewable energy sources (wind, solar, and geothermal) and negatively associated with conventional energy sources*.

An overall model was developed using multiple regression analyses to determine correlations between values/ environmental orientation and perception/preference for each energy type (Table 10). Preference for the energy types was based upon three of the indicators of social acceptance – perception, fear-worry, and fear-concern. Added to this

model were several other variables including self-reported knowledge, whether or not respondent or a family member worked in the industry, whether or not respondent had the energy development on their property, sex, age, income, education and race. An Ordinary Least Squares regression was conducted in order to determine the predictive power of these variables for stated energy preferences. The OLS equation for this relationship is (Table 10):

$$Y = c + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \ldots + e,$$

Multiple regression analyses found positive associations between Conservation and acceptance of oil and gas ($p = 0.012$) and nuclear energy ($p = 0.010$), both conventional energy sources. This relationship only partially supported H2, as there was no relationship found between Self-Enhancement and conventional energy sources, and no relationships found between either of these two values and renewable energy sources. The other association was a negative correlation between Self-Transcendence and oil and gas ($p = 0.030$). This relationship only partially supported H3, as there were no relationships found between Self-Transcendence and the other conventional energy sources or any of the renewable energy sources, and no relationships at all between Openness to Change and energy preference/acceptance. Again, the significant value types, Conservation and Self-Transcendence, were both values with a social focus, but predominantly there was no correlation between value category and support for any particular energy type.

Table 10. Correlations between acceptance of various energy types and values, NEP, self-reported knowledge, individual/family member works in industry, energy development on property, age, sex, education, income, race. (The statistics in the body of the table represent the correlation coefficient with the p-value of each in parenthesis).

	Oil & Gas	**Nuclear**	**Coal**	**Wind**	**Solar**	**Geothermal**
	F (22, 203) = 4.19	F (20, 207) = 6.32	F (20, 191) = 3.52	F (22, 191) = 2.25	F (21, 192) = 4.81	F (19, 208) = 6.59
	Prob < 0.001	Prob < 0.001	Prob < 0.001	Prob <0.002	Prob <0.001	Prob <0.001
	R^2 = 0.3122	R^2 = 0.3793	R^2 = 0.2693	R^2 = 0.2057	R^2 = 0.3449	R^2 = 0.3757
	N = 266	N = 228	N = 212	N = 214	N = 214	N = 228
Variables						
Self-Enhancement	-.03 (.76)	-.09 1(.27)	-.09(.32)	-.04 (.69)	-.03 (.75)	.07 (.50)
Conservation	***.31 (.01)***	***.31 (.01)***	.22 (.12)	.03 (.85)	-.08 (.57)	-.16 (.31)
Open. to Change	.07 (.54)	-.19 (.10)	-.03 (.81)	-.11 (.47)	-.03 (.82)	-.01 (.97)
Self-Transcend.	***-.33 (.03)***	.17 (.24)	-.19 (.24)	.11 (.52)	.19 (.27)	.19 (.31)
NEP	-.10 (.37)	-.04 (.70)	-.13 (.25)	***.33 (.01)***	***.44 (<.0001)***	.20 (.14)
Knowledge	***.28 (<.0001)***	***.32 (<.0001)***	***.36 (<.0001)***	***.34 (<.0001)***	***.46 (<.0001)***	***.57 (<.0001)***
Work in Industry	.13 (.33)	.19 (.18)	-.23 (.66)	.28 (.56)	---	---
Energy / Property	.10 (.63)	---	---	.66 (.40)	-.11 (.84)	---
Age	***.02 (.001)***	.01 (.08)	-.01 (.23)	-.01 (.24)	.00 (.99)	.00 (.81)
Sex	***.29 (.046)***	***.57 (<.0001)***	.28 (.08)	.12 (.48)	-.10 (.54)	***.63 (.001)***
Race	-.22 (.27)	***-.37 (.047)***	-.20 (.32)	.14 (.52)	-.04 (.86)	-.20 (.40)
Education						
HS/GED	-.89 (.13)	***-1.32 (.021)***	***-1.62 (.009)***	.37 (.57)	-.94 (.14)	***-1.80 (.016)***
Mil/Trade/Coll.	-.86 (.21)	***-1.13 (.048)***	***-1.52 (.013)***	.19 (.78)	-.69 (.28)	-1.44 (.05)
College Grad	-.73 (.21)	-.94 (.01)	***-1.43 (.021)***	.04 (.95)	-.80 (.21)	-1.47 (.05)
Post-Grad	-.45 (.46)	-.99 (.10)	***-1.56 (.016)***	.34 (.63)	-.90 (.18)	-1.17 (.14)
Income						
$15,000 to $24,999	-.47 (.15)	.02 (.94)	-.45 (.20)	.20 (.61)	-.27 (.46)	-.65 (.12)
$25,000 to $34,999	.10 (.78)	.06 (.86)	.33 (.37)	.45 (.26)	-.21 (.59)	.19 (.67)
$35,000 to $44,999	-.25 (.48)	-.05 (.87)	.14 (.71)	.27 (.51)	-.50 (.21)	-.57 (.20)
$45,000 to $74,999	-.09 (.77)	.18 (.55)	.05 (.87)	.43 (.23)	-.31 (.36)	-.41 (.29)
$75,000 to $99,999	-.22 (.50)	.02 (.94)	-.19 (.58)	.12 (.74)	-.46 (.20)	***-.90 (.027)***
$100,000 or more	-.07 (.81)	.63 (.83)	.04 (.91)	-.00 (.99)	-.41 (.23)	-.47 (.22)

The fourth hypothesis addressed the question as to whether environmental orientation (NEP) affected perception of and/or preference for energy type: *H4: High NEP scores will be positively associated with acceptance of renewable energy sources and negatively associated with acceptance of conventional energy sources*. Results showed positive associations between NEP and wind ($p = 0.010$), as well as solar energy ($p = <0.001$), both of which are renewable energy sources. These results only partially supported the renewable aspect of H4, since geothermal energy was also presented as a renewable energy source, but its acceptance was not found to be associated with environmental orientation. There were also no associations found between environmental orientation and conventional energy sources.

The next part of the overall model included the variables of self-reported knowledge, whether or not respondent or a family member worked in the industry, whether or not respondent had the energy development on their property, and the demographic variables of sex, age, income, education and race, as stated earlier.

When respondents considered themselves to be knowledgeable about the particular type of energy, there was a positive association, with all energy types (Table 10). There were no correlations with any of the energy types and whether a respondent or a family member worked in that energy industry. The presence of energy resources (13% oil and gas, 2% solar, and 1% wind) on some respondents' land did not influence their perceptions about various energy sources. Geothermal energy was presented as a new form of renewable energy, so participants were not asked if they or family members worked in that industry or whether they had any geothermal development on their

property. However, 70% of the respondents did not feel they knew enough about this energy source to accept it: 46% disagreed with the statement, "I consider myself knowledgeable about geothermal energy," and 24% indicated they were unsure.

Demographic factors, in some cases, were associated with perceptions about energy resources. There was a positive correlation between age and perceptions about oil and gas ($p = .001$). Additionally, male respondents were more favorably disposed to oil and gas ($p = 0.046$), nuclear energy ($p = <0.0001$) and geothermal energy ($p = 0.001$). Non-whites perceived nuclear energy more negatively than whites ($p = 0.047$). Overall, among these respondents, there was no clear association between energy preference and age, education, income, or race. Level of education produced mixed results. Compared to those with only an elementary school education, those who achieved high school graduate/GED, and military/trade school/some college status showed significantly more negative attitudes towards nuclear energy ($p = 0.021$ and $p = 0.048$, respectively). All levels of education above elementary school expressed more negative perceptions about coal (e.g., high school grad/GED $p = 0.009$, military/trade school/some college $p = 0.013$, college graduate $p = 0.021$ and post-graduate $p = 0.016$). Additionally, respondents with high school grad/GED had more negative perceptions of geothermal energy when compared to those with only an elementary school education. Compared to respondents who reported being in the lowest income category (<$15,000), there were no income-related associations between higher level of income and perceptions about energy types, with the exception of geothermal energy. Respondents who earned

between $75,000 and $99,999 had more negative perceptions ($p = 0.027$) when compared to respondents in the lowest income category.

Discussion

The goal of this dissertation was to proactively examine the social dimensions of new energy development, by identifying the role that personal values may play in the acceptance of new development. The central contributions of this study were to provide new insights concerning the association between selected personal values and energy development. The study used Schwartz's values theory and the NEP, along with the literature concerning the concepts of values and environmental attitudes. In order to provide these insights, respondents' values and acceptance of, or preference for, different types of energy were determined.

The survey respondents overall had positive perceptions of oil and gas, nuclear, wind, and solar energies. Geothermal energy was presented as a possible new type of renewable energy. However, the majority of respondents were unsure how they felt due to lack of knowledge. Coal was the only energy type that produced predominantly negative perceptions among respondents due, in part, to the respondents being well informed after a recent lengthy battle to keep a coal plant out of Matagorda County.

This research began by addressing whether or not there was a relationship between value type and environmental orientation, or NEP, as shown by some studies (Grob, 1995; Karp, 1996; Schultz and Zelezny, 1999). In Grob's (1995) study, he determined that post-materialistic values and openness to new thinking positively influenced environmental behavior. Post-materialistic values could also be considered

Self-Transcendence values in Schwartz's terminology and open thinking is similar to Schwartz's Openness to Change value. These are both self-expansive values, on the right side of the Schwartz model of higher order values. Karp (1996) also divided his value structure along the vertical left-to-right axis of Schwartz's model, and determined that the values of Self-Transcendence and Openness to Change had a positive influence on environmental behavior, and the values of Self-Enhancement and Conservation had a negative influence on environmental behavior. Likewise, Schultz and Zelezny (1999) found that Self-Transcendence was positively associated with the NEP, and Self-Enhancement and Conservation were both negatively associated with the NEP. The hypotheses of this study did the same and divided the Schultz higher order value model on the self-protective versus the self-expansive values (vertical left-to-right axis). It was expected that Self-Transcendence and Openness to Change would both be positively related to a high NEP score. Both of these values are self-expansive values and oriented toward concern for others and nature (Self-Transcendence), and independent thought favoring change (Openness to Change). Conversely, it was anticipated that Self-Enhancement and Conservation would be negatively correlated with NEP, because both are self-protective values and oriented toward control or dominance over people and resources (Self-Enhancement), and preserving the status quo (Conservation) (Bidwell, 2013; Karp, 1996; Schultz and Zelezny, 1999). However, the results of this study did not fully support these predicted relationships. Results that partially supported the hypothesized relationships included a positive relationship between Self-Transcendence and NEP, and a negative relationship between Conservation and NEP. Study results

showed significant relationships with environmental orientation between values on the bottom half of the grid in Figure 4, i.e., values with a social focus, but no relationship with the values in the top half of the grid, i.e., values with a personal focus. These results did not fully corroborate those from previous studies that found correlations between environmental attitudes or behaviors and the self-protective versus self-expansive values. While most studies have been done on values as predictors of environmental behavior, this study looked at the possibility of values as predictors of perceptions or attitudes concerning issues that affect the environment, i.e. energy development. This study also examined attitudes, since Rokeach (1968) theorized that values serve as standards used by individuals not only to determine their own behavior and actions, but also their attitudes. Another difference between this study and others (Karp, 1996; Schultz and Zelezny, 1999) was the makeup of the respondents. Earlier studies focused on college students, while the respondents of the current study were much older (median age 59). Schultz and Zelezny (1999) acknowledged that college students may not have been a representative sample, and did not reflect the general views of others.

This study found relationships between energy preference, and only those values that have a social focus, i.e., Conservation and Self-Transcendence. Both Self-Enhancement and Openness to Change share the basic value of hedonism. Steg et al, (2014) studied the role hedonistic values played in environmental attitudes and perceptions. Their research found hedonistic values inhibited pro-environmental choices and therefore, it was important to include hedonistic values in environmental research. This study found no correlations between the higher order values incorporating

hedonism and any attitudes or perceptions regarding energy preference. However, Steg et al. (2014) studied values and their relationship to actions, such as consumer choices and car use. The research presented here studied values and their relationship to respondents' attitudes toward energy development in their community. This emphasized a social (as opposed to a personal) focus. This knowledge can contribute to the practical understanding of how local leaders and business developers can ensure that local residents' values are better incorporated in strategies aimed at bringing in new energy development. Information about possible new energy development should focus on how the local community will benefit in ways that address what the two higher order values represent. This would include how the development would benefit not just the welfare and interests of the people and the local environment, but also how it would offer security by helping to maintain the cultures and traditions that make the community a desirable place to live.

While values overall may not be good indicators of energy preference, this study found that pro-environmental orientation (as measured by high NEP scores) might be a good indicator of preference for renewable energy types. However, this study did not show any support for the expected negative correlation between NEP and nuclear energy, as shown by other studies (Bidwell, 2013; Dietz and Shwom, 2005; Whitfield et al., 2009). Although 70% of the survey respondents had high NEP scores, along with the expected positive perceptions of wind and solar power, respondents also deemed oil and gas and nuclear power to be acceptable forms of energy. This may be due to the finding that self-reported knowledge about an energy type is a positive determinant in the

acceptance of that type of energy. Therefore, having knowledge of nuclear energy proved even more important in its acceptance than having a pro-environmental orientation or even working at the nuclear plant. The County's long history of oil and gas development may also account for the acceptance of this energy type. This supported the idea that when trying to develop a new energy source, the first step should be to increase the public's knowledge, which is a social rather than technological challenge (Assefa and Frostell, 2007).

Although geothermal energy was presented as a renewable energy source, lack of knowledge most likely led to a lack of clear perception about its acceptability. This suggested that an energy source cannot simply be presented as "renewable" to gain acceptance, even to a group with an environmental orientation. Rather, perceived individual knowledge about an energy source seems to be a critical determinant of its acceptance. Earlier studies made it clear that residents wanted unbiased information about new energy development (Assefa and Frostell, 2007; Bradbury et al., 2009; Oikonomou et al., 2009; Theodori, 2009; Walker et al., 2007; Walker et al., 2010). They wanted to know both the positive and the negative factors involved so that they would be able to make what they felt would be an informed decision regarding development. If industry or local leaders were to consider developing geothermal energy resources within Matagorda County and elsewhere, it is critical they present timely and factual information about the energy source. This will enable community members to learn and make up their minds based upon transparent and factual information, rather than waiting

until they have been exposed to second hand knowledge from resources that may be less than reliable.

While this study succeeded in answering the research questions, and supported the notion that values were important to consider when planning new energy development, there are several limitations that must be noted. First the low response rate and lack of a follow-up non-response bias survey and analysis limited the extrapolative power of the research results. Also, this research was conducted in a County that has more experience with different types of energy than other Texas counties. It is also possible that having first-hand experience with certain energy types may change attitudes toward s that energy regardless of value set (e.g., 70% of the respondents had high NEP scores, yet considered oil and gas and nuclear power, traditionally not considered to be "environmentally friendly," to be acceptable forms of energy). Future studies could address a larger population, and include data from multiple sites with different types of local energy sources. Longitudinal studies could also be conducted throughout the process of development, to see how perceptions change over time with more exposure and experience.

Conclusions

While value types overall were not strong predictors of energy preference or acceptance in this study, this did not mean that the values and environmental orientations held by a specific locality should be overlooked by those who wish to promote new energy development within that locality. Values act as determinants of public opinion and should be taken into consideration when presenting new developments. As Bidwell

(2013) reported, conflicts rooted in values must be handled through participatory processes. The participatory process should not be considered an effort to change minds or win people over, but rather to explore and voice common interests and find solutions to satisfy different values. By first addressing the concerns of local stakeholders and taking into consideration their values and environmental orientation, developers of new energy technology could benefit from a public that is better informed and could, in turn, benefit from a higher degree of acceptance of new development.

Despite the limitations of this study, several of the key findings have implications for energy development policy in environmentally sensitive coastal areas and other areas considering new development. In would be in the best interests of energy development companies and local leaders to take local values into consideration in the policy and decision-making process in new energy development. By understanding the values that underlie people's attitudes, developers and leaders could more effectively address conflict, and by incorporating local values into the process, conflict could be minimized.

CHAPTER III

COMMUNICATIVE FRAMING BASED ON VALUE ORIENTATION AND ENVIRONMENTAL ORIENTATION

Overview

This chapter describes the results of a 2014-2015 survey of residents of Matagorda County Texas, USA. The purpose of the research was to determine whether framing information about the benefit of a new type of energy affected the self-reported acceptability of the new energy type. It was hypothesized if information was framed in a manner congruent with a person's value type or environmental orientation then that statement would be more appealing than a statement that was framed in a manner not consistent with that person's value type or environmental orientation. To determine values and environmental orientation, two scales were utilized, the Schwartz Portrait Values Questionnaire (PVQ) and the New Ecological Paradigm (NEP). A mail survey of residents of Matagorda County, Texas was conducted to obtain data to test the hypothesis. Data analysis corroborated the hypothesis with respect to a person's environmental orientation. However, the study yielded mixed results with respect to a person's value type. Therefore, knowledge of environmental orientation appears to be important for energy developers and local leaders who propose new energy development such as low-temperature geothermal energy (LTGE), or other technologies that may have environmental effects. Framing new information based upon a person's environmental orientation may make that information more appealing, or at the very

least, leave recipients more inclined to listen to the new information, before making any decisions.

Introduction

New types of energy development are increasingly being met with more scrutiny and opposition than ever before. This is evident in public protests that often accompany attempts to establish new energy development. Whether it is hydraulic fracturing of gas shale deposits, construction of wind turbines along coastal areas, or new coal-fired energy plants, there are countless local news reports that document opposition (Bidwell, 2013). This study determined whether the way information about new energy development was framed could affect acceptance of the proposed development and, if so, help minimize or avoid conflict at the start of a new project. The study examined whether framing information based upon a person's value type and/or environmental orientation made that information more appealing. If so, then framing issues with respect to a person's values or environmental orientation might enhance support for a novel energy concept, such as low-temperature geothermal energy (LTGE), and could help minimize or avoid conflict at the start of a new project.

Combining framing techniques within a values context could increase understanding of different views, and by identifying common interests could enable stakeholders to avoid conflict that often results from an "us vs. them" mentality. This research demonstrated the importance of relating the framing of new energy development issues to the value types and environmental orientation of the stakeholders. In order to determine participants' value types and environmental orientation, the

Schwartz Portrait Values Questionnaire (PVQ), and the New Ecological Paradigm (NEP) scale (Dunlap et al., 2000), were used.

Understanding a stakeholder's basic values and their beliefs about the relationship of humans to the environment (hereafter referred to as environmental orientation) could enable developers and local leaders to utilize framing techniques within the context of stakeholders' values and environmental orientation, in order to present new information in a manner that is compatible with those values and environmental orientation. This may enhance support of a novel energy concept, and minimize or avoid conflict at the start of a new project.

Framing Theory

In their study of group dynamics, Klimoski and Mohammed (1994) described the concept of mental models as a process by which individuals understand or make sense of their surroundings. A mental model acts as a framework to explain how knowledge and information are represented in the mind. This model allows individuals to organize and categorize what they "know," and along with their individual experiences, helps them to choose an appropriate course of action. According to Newell et al. (2014, p. 449), "Mental models are derived from people's intuitive beliefs and knowledge stored in long-term memory. The mental models of nonexperts typically lack the detail and coherence of scientific models…They nevertheless have a profound influence on reasoning, prediction, and ultimately action." Other scholars, such as Benford and Snow (2000), referred to the similar concept of schemas to describe an individual's expectations about people and events in the world.

Like mental models and schemas, framing also helps individuals interpret or make sense of their world based upon their own worldview and experiences. Framing is the interaction of our mental models of the world with the situation at hand; i.e., the act of framing applies "information processing rules" to existing mental models or worldviews (Klimoski and Mohammed, 1994, p. 419). These worldviews shape how individuals perceive the world, and like values, function as a guide to actions (Benford and Snow, 2000; Brummans et al., 2008; Peterson, 2003).

Framing theory suggests that frames can be either cognitive or communicative (Borah, 2011; Buijs et al., 2011; Shmueli, 2008). Cognitive frames act as filters that simplify incoming information and help individuals interpret this information in ways that are consistent with their worldviews. Communicative frames become relevant when an individual interacts with others and act as strategic or persuasive devices. Communicative framing gives more importance to certain elements of an issue by bringing them to the foreground (Buijs et al., 2011; Shmueli, 2008), or by focusing on a particular aspect while downplaying or ignoring others. Small changes in the presentation of information produced significant changes of opinion (Chong and Druckman 2007).

Several studies have related framing to values. Barker (2005) studied how framing issues based on values could be used as a form of persuasion during political campaigns, and determined that voters appeared to respond more readily to messages that were framed in "value-friendly" terms. Similarly, Davies (1999) conducted a case study of political framing in the education system of Ontario in which the original

framing of an argument, concerning government funding of religious schools, was later transformed as a result of evolving political cultures and values. By transforming the argument's frame from one based upon religion to one based upon multiculturalism, minority rights, and school choice, the issue became reignited, and the debate was still ongoing at the time the article was published. Brewer (2001, 2003) conducted two studies linking values and framing. In the first study, he mimicked the way media coverage uses framing by using values to frame welfare reform. In the second study, he analyzed mass media coverage of the debate about gay rights, and how values were used to shape public opinion. He determined that people tend to understand issues in terms of values, and that individuals with strong values were less amenable to frames that contradicted those values.

Framing is a dynamic process (Peterson, 2003; Wondolleck et al., 2003), and theory suggests that the way something is presented (the frame) can influence the choices people make. When people feel that their values or beliefs are threatened or challenged, they tend to lock into a position making them less open to different points of view (Wondolleck et al., 2003). Framing techniques can be used to ease people out of these locked positions and find a common ground, or common language to facilitate communication. Locked positions can be converted to common interests, which can create a commonality, and produce a more constructive approach to conflict management and resolution.

Value Types and Environmental Orientation

Rokeach (1968, p. 550) defined a value as "an enduring belief that a particular mode of conduct or that a particular end-state of existence is personally and socially preferable to alternative modes of conduct or end-states of existence." He postulated that values serve as standards used by individuals to determine their own attitudes, behavior, and actions; and also to judge those of others. Values also act as determinants of public opinion. Schwartz (1992, p.1) agreed values are critical motivators of behavior and defined them as "deeply rooted, abstract motivations that guide, justify, or explain attitudes, norms, opinions and actions." Schwartz (2012) went on to develop a theory of basic human values and defined six main features of all values: (1) Values are beliefs, (2) Values refer to desirable goals, (3) Values transcend specific actions and situations, (4) Values serve as standards or criteria, (5) Values are ordered by importance, and (6) the relative importance of multiple values to one another guides action. He then defined 10 culturally universal value constructs, and determined that these had four higher order value types (Table 2). The four higher order value types and the motivational values from which they are comprised (shown in parentheses) are Conservation (security, conformity, tradition), Self-Transcendence (benevolence, universalism), Openness to Change (self-direction, stimulation, hedonism), and Self-Enhancement (hedonism, achievement, power). The four higher order value types can be organized into two basic value dimensions with consistent value compatibilities and conflicts (Schwartz, 1992, 1994) (Figure 4). One dimension compares Self-Enhancement with Self-Transcendence in order to examine values oriented toward the pursuit of self-interest with values

oriented toward the acceptance of and concern for others and the environment. The other dimension compares Conservation (Traditional) with Openness to Change in order to examine values oriented toward preserving the status quo with values oriented toward individual thought and favoring change. This dimensional scale indicates where on the continuum of the four higher level value types an individual assigns the highest priorities.

Schwartz developed several research tools to characterize the basic values of individuals, including a version called the Schwartz Portrait Values Questionnaire (PVQ). This scale could be applied to diverse populations, including those with little or no formal education (European Social Survey, 2014; Schwartz et al., 2001; Schwartz, 2012). The PVQ consists of statements describing a person. Survey participants are asked to read each statement or "portrait" and decide how much the person in the portrait is like him or her. There are several versions of the PVQ, which differ in the number of included items and the number of basic values selected to address specific research questions.

Values have also been linked to environmental concern. Dunlap and Van Liere (1978) proposed that environmental problems were tied to traditional values, and that society's desire to grow and prosper came at the expense of environmental degradation. Stern et al. (1995) theorized that certain values were associated with willingness to take pro-environmental action, and Dietz et al. (2005) asserted that values are the bases for environmental concern, and influence how individuals think and behave towards the environment.

Dunlap and Van Liere (1978) developed the New Environmental Paradigm (NEP), in which humans are an integral part of nature and all of nature has intrinsic value. In contrast, the then-prevalent Dominant Social Paradigm (DSP), viewed humans as superior to all other species, with the natural environment theirs to use without constraint. They measured this mindset with the NEP scale. Later, Dunlap et al. (2000) developed another NEP scale, the New *Ecological* Paradigm, to offer a better balance between pro- and anti-NEP statements, and to revise outdated terminology. The NEP consists of 15 items that include categories such as the balance of nature and human interaction with the environment. A high NEP score indicates an endorsement of a more environmentally conscious worldview (pro-NEP), and a lower score (anti-NEP) reflects an endorsement of the DSP worldview.

Combining Values and Framing Theory

An individual's values may be based, in part, upon their cultural background (Schwartz, 2006). The study presented here sought to link framing with basic values theory. Combining framing techniques within a basic values context could increase understanding of different views. Identification of common interests could enable stakeholders to avoid the conflict that often arises as the result of an "us vs. them" mentality. This research demonstrated the importance of relating the framing of new energy development issues to the basic value types of the stakeholders, as determined by the Schwartz PVQ and the NEP scales. Understanding a stakeholder's basic values and/or environmental orientation would enable the researcher to utilize framing techniques within the context of the stakeholder's values and environmental orientation,

in order to present new information in a manner that is congruent with those values and environmental orientation. Framing issues with respect to a person's values or environmental orientation may enhance support of a novel energy concept, and could help minimize or avoid conflict at the start of a new project.

Research Question and Hypotheses

This study sought to answer the question: Does framing a statement about the benefit of a new type of energy, with respect to an individual's value type or environmental orientation, affect the individual's perceived acceptability of the energy type? Previous research (Barker, 2005; Brewer, 2001; Brewer, 2003, Chong and Druckman, 2007) found individuals responded more favorably to messages framed in value-friendly terms. To answer this question, several objectives were addressed: first, determine respondents' value set, and next, establish respondents' environmental orientations. After determining respondents' values and environmental orientation, this study assessed whether there were any relationships between different ways of framing statements regarding LTGE and respondents' value type and/or environmental orientations. Both basic values and environmental orientation are values, and the following hypotheses proposed that framing information in value–friendly terms would affect how the message was received.

The two hypotheses used to address the research question were:

H1: Framing the benefit of a new type of energy (LTGE) with respect to a person's value type will make that statement more appealing than a statement framed in a manner that is not consistent with that value type.

H2: Framing a benefit of a new type of energy (LTGE) with respect to a person's environmental orientation will make that statement more appealing than a statement framed in a manner that is not consistent with that environmental orientation.

Methods

Study Area

A mail survey was conducted in Matagorda County Texas (Figure 1). This County was chosen due to its atypical relationship with different types of energy development. Oil and gas development have been present in the County for over one hundred years; it is one of only two counties in Texas to have an operating nuclear power plant (South Texas Project - STP, which has been online since 1988); and there was a recent attempt to build a coal-fired electricity plant there, which failed largely due to public opposition (No Coal Coalition, 2013). The County is also located in an area that has been shown to have potential for as yet undeveloped low-temperature geothermal energy (LTGE) (SECO, 2014) (Figure 2). With its location on the Gulf of Mexico, and rivers, bays, wildlife refuges, and a barrier island within its borders, Matagorda County is also considered an environmentally sensitive area.

Mail Survey

In order to develop a questionnaire that addressed the issues of energy development among Matagorda County residents, key informant interviews and focus groups were conducted. These are methods commonly used to understand community concerns (Sangaramoorthy, et al. 2016; Theodori, et al. 2009). A mail survey questionnaire (Appendix A) was designed to explore opinions concerning energy types

and their development, and to assess participants' basic value types and environmental orientation, along with demographic data. The questionnaire was also designed to determine the extent to which the manner in which information about new energy development is framed, with respect to value and/or environmental orientations, would affect the acceptability of the statement by residents of Matagorda County.

The population of Matagorda County is approximately 36,000 (Texas Almanac, 2014-2015). Based on this figure, the required minimum sample size of respondents needed to achieve a sample error of 5% with a confidence level of 95% was determined to be 380. This required minimum sample size was then doubled to offset nonresponse bias. As a result, survey questionnaires were mailed to 800 addresses in Matagorda County, obtained from Survey Sampling International, a survey research company.

The survey questionnaire was sent to randomly selected residents of Matagorda County Texas who were aged 18 or older. The survey was conducted between August 2014 and March 2015 and consisted of five mailings including: a pre-survey notification letter (day 1); the survey questionnaire with a cover letter (day 7); a thank you/reminder postcard (day 14); a replacement questionnaire with a second cover letter for non-respondents (day 28); and a final thank you/reminder card (day 42). Mailings were initially sent to 800 randomly selected addresses. However, due to the high proportion of bad addresses (almost 21%) and low response rate, a second set of mailings, following the identical research protocol, was sent to an additional 500 addresses beginning in November 2014. Due to the additional mailings occurring during the year end public holidays, the intervals between the second set of mail-outs were as follows: pre-survey

notification letter went out on day 1; the survey questionnaire with cover letter went out on day 14; the first thank you/reminder postcard went out on day 21; a replacement questionnaire with a second cover letter for non-respondents went out on day 46; and the final thank you/ reminder card went out on day 61.

Values - Schwartz Portrait Values Questionnaire (PVQ)

This study utilized a version of the Schwartz PVQ consisting of 34 brief statements about personal value characteristics (S. Schwartz, personal communication June 15, 2014). The survey participants were asked to read each description and think about *"How much like you is this person"* and then choose from one of six responses ranging from *Not Like Me At All* to *Very Much Like Me* (Table 6). Scores were calculated for the four higher level value types (Table 2, Figures 3 and 4) according to a coding key provided by Dr. Schwartz (S. Schwartz, personal communication June 15, 2014). A principal components analysis (PCA) indicated that the 34 items and their associated four value types (Conservation, Self-Transcendence, Openness to Change, and Self-Enhancement) were internally consistent and produced Cronbach's alphas ranging from .79 to .82. The four value types were used as explanatory variables for the extent to which the framing of information about a new energy type based on value type affected the acceptability of statements about the energy type.

Environmental Orientation - New Ecological Paradigm (NEP)

The NEP scale was based on 15 items designed to measure endorsement of an environmentally-friendly paradigm (Dunlap et al., 2000). The survey participants were asked to read statements about people and the environment and then indicate the extent

to which they agreed with the statement using a 5-point scale ranging from *Strongly Disagree* to *Strongly Agree* (Table 7). A principal components analysis (PCA) indicated that these 15 items were internally consistent and produced a Cronbach's alpha of 0.79. The overall NEP score for each respondent was calculated by averaging each of the 15 response items according to the response choice (0 = Unsure, 1 = Strongly Disagree .., 4 = Strongly Agree). Even numbered statements were anti-NEP statements, and therefore were reverse coded. Higher NEP scores (pro-NEP) indicated an endorsement of a more environmentally conscious worldview and lower scores (anti-NEP) reflect an endorsement of the DSP worldview. To achieve these scores, the means were divided into three categories: pro-NEP (Mildly Agree and Strongly Agree -responses yielding an average score > 2), anti-NEP (Strongly Disagree and Mildly Disagree -responses yielding a score of > 0 and $\leq$ 2), and Unsure (yielding a score of zero). The pro-NEP and anti-NEP categories were used as the explanatory variables to determine the extent to which the framing of information based on environmental orientation affected the acceptability of statements about energy type.

Framing Statements

Participants were given two sets of statements, each describing a benefit of geothermal energy. The first set had four statements, and each statement was worded in a manner that was congruent with one of the four higher order value types. Participants were asked to read the statements and then rank them from 1 to 4, in order of which benefits were most appealing to them, with "1" meaning "*Most Appealing*" and "4" meaning *"Least Appealing."* The second set contained two statements, each worded in a

manner that was consistent with either a pro-NEP, or an anti-NEP orientation. Participants were asked to read the statements and then rank them either one or two, depending on which was most important to them, with "1" meaning *"Most Important"* and "2" meaning *"Not As Important"* (Table 11).

Table11. Value types and statements framed to be congruent with each type of value.

Value Type	**Statement**
PVQ Values:	
Conservation	Geothermal energy offers a secure form of energy – it reduces our dependence on foreign oil; since the infrastructure is underground it is less susceptible to natural disaster or attack; and it is not dependent on weather conditions, so it can produce power 24 hours a day, 365 days per year.
Self-Transcendence	Geothermal energy emits almost no pollution; its use can result in reduced reliance on fossil fuels; and its power stations have a much smaller impact on the surrounding environment than other forms of energy production.
Openness to Change	While geothermal resources have been used in some form by people for centuries, the technological utilization of low-temperature geothermal energy as a renewable energy source is a recent and innovative development.
Self-Enhancement	Development of geothermal energy is a fast growing technology with new and emerging opportunities for business development and possible financial gain.
NEP	
Pro-NEP	Geothermal energy does not contribute to pollution; it is cleaner, and more efficient than burning fossil fuels.
Anti-NEP	Geothermal energy uses the heat beneath our feet; with the right technology it is ours for the taking and, therefore, it should be more widely developed.

Data Analysis

Survey data were entered into a Microsoft Excel spreadsheet and analyzed using STATA 13.1 (StataCorp, 2015). Statistical analyses included frequency distributions and multiple regression models. Multivariate ordinal logistic regression models were used for the first set of statements to estimate the relationship between the dependent variable of how an individual ranked a statement describing a benefit of geothermal energy, and the independent variables, respondents' value type. Each statement described a benefit of geothermal energy that was framed in a manner meant to appeal to one of the four higher order value types. The participants were asked to rank the statements from 1 to 4 ("1" meaning "*Most Appealing*" and "4" meaning *"Least Appealing.")*. Ordinal logistic regression was used because the distance between responses could not be assumed to be equal. Value types are a continuous variable, and the highest score became that respondent's "value type." A positive coefficient indicated the higher the level of value type, the lower the ranking number (more appealing). A negative coefficient indicated the higher the individual ranked on that value type, the higher the ranking number would be (less appealing).

A logistic regression model was used for a second set of statements, to analyze the relationship between statements describing a benefit of geothermal energy (dependent variable), and respondents' environmental orientation (independent variable). Logistic regression was used because the dependent variable was dichotomous, with two response options: "1," meaning the respondent ranked the statement as "1," or *Most Important*, or "0," meaning the respondent ranked the statement as "2," or *Not As*

Important. The logistic regression estimated the probability that the statement would be ranked "1."

Results

Mail Survey Results

Of the total 1300 questionnaires mailed out, 278 were returned by the Post Office. Of the remaining 1022 questionnaires, 316 were returned by the addressee, giving a raw response rate of 31%. Of these, 42 were unusable for various reasons including, addressee deceased, poor eyesight, age, or respondent chose not to complete the questionnaire. This left 274 completed questionnaires with a useable response rate of 27%. This response resulted in a sampling error of 6% with a confidence level of 95%. Time and budgetary constraints did not allow for a follow-up non-response bias analysis, which limits the extrapolative power of the results.

Respondent Profiles

The length of time respondents lived in Matagorda County ranged widely from two months to 86 years with a median value of 32 years and a mean value of 34 years (SD = 21.73). Respondents were predominantly male (61.5%) ranging in age from 22 to 91 with a mean age of 59 (SD = 14.4), and 86% of them owned property in Matagorda County. The majority (83.5%) were White, followed by Hispanic (9.4%). The majority had some college, or were college graduates (29.0% and 27.4%, respectively). Forty percent (40%) were employed full-time, 33.2% were retired, and 9% were self-employed. Income ranged from < $15,000 to > $100,000 (34.4%). When asked if respondents or family members worked in the various industries, results were: oil and

gas - 91 (34%), nuclear - 90 (33%), wind - 7 (3%) and coal 4 (2%). No one worked in the solar industry. Geothermal was not a category since it currently does not exist within the County. Eighteen respondents (7%) indicated they had some form of alternative or renewable energy generation on their property in Matagorda County or elsewhere, including solar, wind, and one heat pump.

Statements Framed for Value Types

Table 12a shows statements framed according to each of the higher order value types along with results of the ordinal logistic regression analysis of each of the four value-oriented framing statements. There seemed to be confusion among some respondents concerning the concept of ranking, with some using the same ranking score multiple times. As a result, the frequency distributions of respondents' rankings for each statement were included and are indicated in Table 12b.

The first statement was framed to appeal most to those who scored highest on the Conservation (security, conformity, tradition) value type. The frequency distribution shows this statement was ranked as "Most Appealing" by 47% of the respondents. However, the analysis found no statistical relationships between the framing statement and any of the value types.

The second statement was framed to appeal most to those who scored highest on the Self-Transcendence (benevolence, universalism) value type. Thirty-nine percent (39%) of respondents ranked this statement as "Most Appealing." Regression analysis supported the expectation that the framing statement would be most appealing to those

Table12a. Results of ordinal logistic regression for statements describing benefits of geothermal energy framed according to each of the four value types.

Value type	Coeff.	Std. Error	z	P > |z|
Conservation oriented framing statement				
Openness to Change	-.0684	.2085	0.33	0.743
Self-Transcendence	-.3116	.2473	1.26	0.208
Conservation	.2641	.2065	-1.28	0.201
Self-Enhancement	.0302	.1548	-0.19	0.845
Self-Transcendence oriented framing statement				
Openness to Change	-.2577	.2105	1.22	0.221
Self-Transcendence	.6067	.2565	-2.37	**0.018**
Conservation	-.1500	.2085	0.72	0.472
Self-Enhancement	-.0315	.1483	0.21	0.832
Openness to Change oriented framing statement				
Openness to Change	-.1945	.2027	0.96	0.337
Self-Transcendence	.0166	.2406	-0.07	.0945
Conservation	.1905	.1980	-0.96	0.336
Self-Enhancement	.0500	.1466	-0.34	0.733
Self-Enhancement oriented framing statement				
Openness to Change	-.1251	.2044	0.61	0.541
Self-Transcendence	-4756	.2490	1.91	0.056
Conservation	.4354	.2117	-2.06	**0.040**
Self-Enhancement	.3106	.1473	-2.11	**0.035**

with a Self-transcendence value set ($p < .05$). There were no relationships between the statement and any of the other three value types.

The third statement was framed to appeal to the Openness to Change (self-direction, stimulation, hedonism) value type. Less than a quarter of the respondents (22%) ranked

Table12b. Results of frequency distribution for statements describing benefits of geothermal energy framed according to each of the four value types.

Value oriented framing statement	**Distribution of rankings (frequency/percentage) 1=Most Appealing; 4=Least Appealing**			
	1	2	3	4
Conservation	**121/47%**	74/29%	31/12%	29/11%
Self-Transcendence	**99/39%**	77/31%	50/20%	26/10%
Openness to Change	56/22%	56/22%	**77/31%**	66/25%
Self-Enhancement	68/27%	57/23%	45/18%	**80/32%**

this statement as "Most Appealing", and there was no statistical relationship between the statement and any of the four value types.

The fourth statement was framed to appeal most to those who scored highly on the Self-Enhancement (achievement, power, hedonism) value type. Just over a quarter (27%) of the respondents ranked it as "Most Appealing." Those respondents who represented the Conservation and Self-Enhancement value types were more likely to rank this statement highly ($p < .05$). These two value categories are most closely related on the values continuum, and are both self-protective values. By contrast, the relationships between this statement and the other two value types were not significant.

Statements Framed for Environmental Orientation

Table 13a presents the results of the logistic regression analysis for the relationship between statements about geothermal energy production and NEP scores. Similar to the framing for value types, some respondents used the same ranking score

Table13a. Results of logistic regression for statements describing benefits of geothermal energy framed according to environmental orientation.

Statement	Coeff.	Std. Error	z	P > |z|
Pro-NEP oriented statement (clean energy emphasis)	.994	.244	4.08	**0.000**
Anti-NEP oriented statement (utilitarian emphasis)	-.596	.209	-2.85	**0.004**

Table13b. Results of frequency distribution for statements describing benefits of geothermal energy framed according to environmental orientation.

NEP oriented framing statement	Distribution of rankings (frequency/percentage)	
	"Most Important"	**"Not As Important"**
Pro-NEP oriented statement (clean energy emphasis)	**180/70%**	78/30%
Anti-NEP oriented statement (utilitarian emphasis)	120/47%	**135/53%**

more than once, and therefore, the frequency distributions of respondents' rankings for each statement were included in Table 13b. The results showed that the first statement, which was framed in a pro-NEP manner and emphasized the clean energy characteristics of LGTE, was ranked as "Most Important" by 70% of the respondents, and the regression coefficient was ($p < .05$). In contrast, the second framing statement, emphasized the utility of LTGE (i.e., pro-consumption, anti-NEP) without referring to environmental benefits, and not compatible with a pro-NEP environmental orientation,

was ranked as “Not as Important” by over half (53%) of the respondents. Regression analysis produced a negative correlation coefficient ($p < .05$). In combination, these results showed that NEP score was positively associated with a framing strategy for LTGE development that emphasized the environmentally benign aspects of this new form of energy.

Discussion

The central contribution of this study has been to provide new insights into the understanding of personal values and their relationship to energy development, in the context of Schwartz’ values theory, the NEP, and the literature concerning the concepts of values and environmental attitudes. The goal of this chapter was to examine whether framing a benefit of LTGE in a manner that was compatible with the respondent’s values (both basic values and environmental orientation) would affect the appeal of that benefit.

Brunsting et al. (2011) found that for the public to make informed decisions, new information should be presented within the context of local realities. This would include presenting information in a manner that was consistent with the local values and orientations. This approach would prevent what Wondelleck et al. (2003) described as individuals locking into positions when they feel that their values or beliefs were being threatened or challenged, thereby making them less open to different points of view. Moreover, Chong and Druckman (2007) determined that people may be more susceptible to framing techniques in the early stages of exposure to an issue, when they are less knowledgeable. Therefore, if industry or local leaders were to consider new energy development, the initial information should be presented to the public framed in a

manner that is consistent with the values and environmental orientation of the local residents. It is critical to present factual information about the energy source in a timely manner, enabling local residents to learn and make up their minds based upon facts, rather than waiting until they have been exposed to second hand knowledge from less reliable sources.

Study results showed that framing a message based upon values as determined by the PVQ produced mixed results for the first hypothesis (*Framing the benefit of a new type of energy (LTGE) with respect to a person's value type will make that statement more appealing than a statement framed in a manner that is not consistent with that value type).*

The statements framed to be congruent with Self-Transcendence values (benevolence and universalism) and Self-Enhancement values (achievement, power, hedonism) were supported. These values compose the dimension that contrasts values oriented toward the acceptance of and concern for others and the environment, with values oriented toward the pursuit of self-interest. These results support some studies of framing theory which suggested the way something is presented can influence the choices people make (Peterson, 2003; Wondolleck et al., 2003), but only partially supported Barker's (2005) study that determined voters appeared to respond more readily to messages that were framed in "value-friendly" terms. This study showed framing techniques worked more effectively on individuals whose value sets were either self-centered and self-protective, or socially-centered with concern for others and the environment. However, as these value sets are polar opposites, it would not be an easy

task to frame information to a group consisting of individuals with these mixed value sets. While these results are interesting as an exploratory study, more research would need to be done utilizing more and different statements to reflect each value set in order to determine if the other value sets (Openness to Change and Conservation) do not readily respond to framing, or whether the statements used in this study did not adequately reflect those value sets. The Conservation value type also positively correlated with the Self-Enhancement statement. The elements of these two value sets are contiguous on Schwartz's values continuum (Schwartz, 2012), making them compatible (Davidov et al., 2008, Figure 3). Therefore, Conservation values may also be amenable to framing if the statements were to actually reflect that value.

While this part of the study succeeded in answering the research question, there were several limitations. As noted, the result of this analysis may, in part, have been affected by apparent confusion among survey respondents about ranking; as some used the same ranking score multiple times. Due to this, frequency distributions were included in the results to show how many times each ranking was assigned to each statement. This problem did not present itself during the pretest phase of the questionnaire development, and future research of this type would benefit by adding one more sentence to the instructions: "Use each number only once."

Another challenge with the framing concept is the construction of statements. Each statement in this study was designed to appeal to a certain value type based upon Schwartz's description of the value types. However, other researchers might design different statements for each value. While the subjective choice of the framing

statements might be of concern, mass media framing of issues is equally subjective. Peterson (2003) and Wondolleck et al. (2003) noted, framing is a dynamic process. Chong and Druckman (2007) stated that there are no straight forward guidelines to define or identify a frame in communication. To determine how variously framed statements affect readers' perspectives, future studies should incorporate multiple statements that relate to each value set and environmental orientation.

Framing a message based upon an individual's environmental orientation as determined by the NEP was more consistent with the expected results. Seventy percent (70%) of the survey respondents had high NEP scores. Framing the benefits of LGTE in environmental terms that were consistent with this pro-environmental orientation was found to be more appealing to respondents than a statement that emphasized the utility of this new energy type. Although this section of the questionnaire presented compelling evidence to support the second hypothesis (*Framing a benefit of a new type of energy (LTGE) with respect to a person's environmental orientation will make that statement more appealing than a statement framed in a manner that is not consistent with that environmental orientation*), along with support for Barker's (2005) study of individuals who responded more readily to messages that were framed in "value-friendly" terms, it should be noted there may have been similar limitations as with the framing of value type statements. These included both the subjectivity of the choice of framing statements, and some of the respondents using the same ranking score for both statements.

This study used both PVQ and the NEP scales to determine which scale produced more useful results for developing framing statements about LTGE. Results showed that the NEP scale was easier to administer and score, and may be a better option for LTGE proponents seeking to inform the public about this energy type.

This study also offered new insight into the relationship between values and framing. Previous research (Barker, 2005; Brewer, 2001; Brewer, 2003, Chong and Druckman, 2007) suggested that individuals responded more favorably to messages framed in value-friendly terms. This study offered some support that framing messages using basic values could be effective. However there was difficulty determining whether framing actually reflected an individuals' particular value type. While this study concluded that the way an issue was framed did indeed affect how the recipients responded to the message, it was also found that framing messages using environmental orientation was most effective in how a person perceived that message.

Conclusions

Rather than using framing techniques as a means to *influence* the choices people make, it would likely be more effective to use framing techniques as a *vehicle for knowledge transfer*. This allows recipients to listen to new information, and then make an informed decision rather than immediately dismissing it. For instance, if stakeholders are concerned about the environmental impacts of development, it may be insufficient to focus entirely on economic benefits, which has often been the primary emphasis.

Knowing that the manner in which new information is presented can affect its acceptance, could be utilized to help minimize or avoid conflict before beginning an

energy development project. Framing issues consistent with people's values or environmental orientations may reduce resistance and enhance support for a novel energy project. This insight could be useful to certain sectors of the energy industry or local leaders who endeavor to bring new types of energy development to their communities in a transparent and proactive manner. It may be in the developers' best interests to determine the values and common interests of local residents and other stakeholders before committing to significant financial investments in new large-scale energy projects. Otherwise it may fail due to legal challenges from excluded and dissatisfied communities and conservation groups.

CHAPTER IV

KNOWLEDGE OF ENERGY TYPES

WITH AN EMPHASIS ON GEOTHERMAL ENERGY

Overview

This study sought to determine what knowledge and perceptions individuals in an environmentally sensitive area, with a potential for low-temperature geothermal energy development, may have concerning geothermal energy. Most research concerning this energy has focused on the economic and environmental aspects of its development. However, for this energy technology to be broadly adopted, it must also be socially acceptable, because to be viable, new forms of energy must be embraced by society. Without societal acceptance, the adoption of new technologies will fail or be unnecessarily slow. Early stakeholder involvement, including dissemination of fact-based knowledge, combined with public input, could lead to greater acceptance of new energy innovations.

A mail survey was conducted in Matagorda County, Texas. The results of this study indicated that individuals need to feel they possess knowledge of an energy type or a development project before they can develop positive perceptions about it. When survey respondents felt they had insufficient knowledge about geothermal energy, their main perceptions were uncertainty. After gaining some knowledge through a brief fact-based informational review of geothermal energy, increase in their self-reported

knowledge, and their perceptions about the new energy type became more positive overall.

One of the main findings of this study was that stakeholders wanted to be informed early on, and needed to feel they were knowledgable about the proposed type of development before they could support it within their County. Study results suggested that it was imperative to sustain open dialogues with the local residents, and to involve them in the decision-making process throughout the development of a proposed energy project.

Introduction

Amid the ongoing controversy concerning climate change, one of the main points of discussion is mankind's' responsibility for altering the carbon cycle by increasing carbon dioxide emissions. This is brought about mainly through the combustion of fossil fuels for energy production and locomotion (U.S. Environmental Protection Agency, 2016). One way to reduce carbon dioxide emissions is to transition to clean, reliable, and affordable energy, which includes the increased use of renewable energy sources, and greater energy efficiency. A renewable energy source unfamiliar to many Americans is geothermal energy. Geothermal energy is heat (thermal) derived from the earth (geo) that can be used to generate electrical energy, and is categorized according to its temperatures (Oregon Tech, 2015).

This study focused on the perceptions of residents of Matagorda County, Texas regarding low-temperature geothermal energy production (LTGE). This area was selected for the study because the coast of Texas has been shown to have potential for

LTGE (Figure 2) and contains environmentally sensitive areas including the Mad Island Wildlife Management Area. The study was partially funded by the Texas General Land Office (GLO) as part of their Coastal Impacts Technology Program (CITP), and the funds were administered through the Houston Advanced Research Center, whose core mission is "to improve human well-being and the environment" (HARC 2015). This study addressed the perceptions of Matagorda County residents about different energy types as well as their knowledge of geothermal energy. The study sought to proactively obtain input from the local residents before new energy sources, especially LTGE, were developed. By measuring indicators of social acceptance, and addressing the concerns of local stakeholders first, it was anticipated that developers of new technology could benefit from a better informed public, which in turn, could result in a higher degree of acceptance of new development.

Low-Temperature Geothermal Energy

Geothermal energy is literally heat (thermal) from the Earth (geo). The temperature of the Earth varies with depth into the Earth's crust, but remains at a fairly steady temperature throughout the year. The various depths and temperatures determine how heat can be utilized at both large and small scales. The main advantage of geothermal power over other renewable energy sources, such as wind and solar energy, is the consistency of the energy supply as well as lower additional surface impact. Unlike wind or solar power, the energy inside the Earth is constant and independent of surface conditions. This provides a secure and reliable source of power year round that requires little infrastructure when combined with existing wells. Geothermal energy is

also considerably cheaper than other alternative energy sources, and can be generated for as little as less than $0.10 per kWh (U.S. Department of Energy, 2016). While this may currently not be competitive with large-scale oil and gas-based energy production, geothermal energy can provide solutions for off-the-grid power in remote locations.

The three broad categories of geothermal energy use are ground source or geothermal heat pumps, direct use, and electrical power generation. The U.S. Geothermal Education Office catalogued various applications of geothermal energy for a range of temperatures, and listed more than 50 potential applications of this energy resource (U.S. Department of Energy, 2015f). Viability of these applications largely depends on the class of the thermal resource. The Geo-Heat Center at the Oregon Institute of Technology categorized geothermal energy according to low (<194°F), moderate (194° - 302°F) and high (>302°F) temperatures (Oregon Tech, 2015).

In the past, geothermal electrical generation occurred almost exclusively via large power plants utilizing the hottest geothermal resources. These resources can generate hundreds of megawatts, and occur mostly in tectonic regions of Western United States. Currently, the most frequently discussed geothermal energy categories are enhanced geothermal systems (EGS) and low-temperature/co-produced geothermal energy (LTGE). Discussion of geothermal energy use is often divided into the categories of electricity generation or direct/indirect use.

EGS utilize temperature resources that exceed 300°F (~150°C) (U.S. Department of Energy, 2015c). These systems are mainly used to generate electric power and require drilling water or steam wells using technologies similar those used to extract oil or gas.

This method of geothermal energy exploitation uses dry steam, flash steam, or binary cycle technologies to convert the heat of hydrothermal fluids or steam to electricity (U.S. Department of Energy, 2015c).

LTGE is derived from low or moderate temperature geothermal fluids (≤300°F, ~150°C) (U.S. Department of Energy, 2015d). These fluids can also be a byproduct of oil and gas wells, referred to as co-produced geothermal fluid. Historically, these byproducts have been regarded as a nuisance, but research is being conducted to determine how heat from co-produced fluids can be used as a source of energy (U.S. Department of Energy, 2015d). LTGE utilization methods involve either direct use of geothermal energy or indirect use via geothermal heat pumps. Direct use exploits the heat in the transfer fluid without the use of power plants or pumps, by being piped directly to locations where heat is required, such as buildings, greenhouses, or under roads or sidewalks to melt ice and snow. On the other hand, geothermal heat pumps (also referred to as earth-coupled, ground-source, or water-source heat pumps) exploit the phenomenon that underground temperatures remain fairly steady throughout the year (Renewable Energy World.com, 2016). This technology consists of pipes buried in shallow ground near a building, coupled with a heat exchanger and ductwork in the building. When ground temperature exceeds air temperatures in the winter, the differential is used to heat buildings. Conversely, when air temperatures exceed ground temperature in the summer, the cooler temperature is used for cooling. Hot water can also be produced by concentrating this heat via a condenser. This use of geothermal energy is gaining popularity in both commercial and residential buildings. About 50,000

new geothermal heat pumps are installed in the USA annually (U.S. Department of Energy, 2015e). LTGE may also lend itself to local energy generation through microgrids – autonomous, self-sufficient, distributed systems that use local energy sources to power a few buildings, homes or factories (Zolli and Healy, 2012).

Importance of Local Perceptions and Acceptance of LTGE

While it has been hailed as an energy source with limited environmental impact, most Americans have little understanding of LTGE and its various uses (U.S. Department of Energy, 2015f). The development of new energy sources often leads to divisiveness and possible litigation by environmental groups concerned about deleterious externalities, such as air and water pollution, for which developers are rarely held accountable (Bidwell, 2013). To reduce the risk of such conflict, it is necessary to ensure that the adoption of a new energy generation technology is not only economically feasible and ecologically sound, but also accepted by society as a viable alternative. Most research concerning geothermal energy has focused on the technical, economic, and environmental aspects of its development. However, if a new technology is not also socially acceptable, its adoption will likely fail or be unnecessarily slow.

The social acceptability of developing LTGE has not been adequately investigated. A review of the literature found a lack of research on the social aspects of this alternative form of energy. This study evaluated the feasibility of the development of this novel renewable energy source as perceived by the residents in one Texas Gulf Coast County, by use of a mail out questionnaire. Questionnaires are important tools used in the social sciences to determine the opinions and perceptions of specified survey

populations regarding natural resources (Adams et al., 2005; Lai and Kreuter, 2012; Martin et al., 2013; Olenick et al., 2005; Sorice et al., 2012; Theodori et al., 2011). In order to develop a questionnaire that addressed the issues of energy development among Matagorda County residents, key informant interviews and focus groups were conducted, methods commonly used to understand community concerns (Sangaramoorthy, et al. 2016; Theodori, et al. 2009). Although Terwel et al. (2011) asserted that traditional public opinion surveys were not always well suited for gaining information about subjects that the public knows little about, they suggested that surveys can be good tools to assess knowledge level, determine concerns, and understand perceptions. This study utilized a mailed questionnaire to determine respondent knowledge, perceptions, and fears of different energy types, including LTGE.

Indicators of Social Acceptance

Studies have used various indicators to determine social acceptance of energy development, other natural resources-based technologies, or the decision-making processes involved in natural resource management decisions. Greenberg (2009) conducted a telephone survey to determine public preferences for seven different energy sources using the following variables as indicators of social acceptance: risk perception, knowledge about nuclear facilities, trust of authority, demographics, values, and location. Assefa and Frostell's (2007) assessment of the public's view of new technologies used the following indicators to quantify social acceptance: knowledge (What does the public know?); perception (What does the public think?); and fear, synonymous with worry or concern (What does the public feel?). While discussing the

fact that it took Swedish citizens 20 years to become less fearful of nuclear energy, the authors speculated that this happened due to either the citizens gaining more knowledge or perhaps, just getting used to the idea of nuclear technology. Accordingly, they considered further nuclear development to be a social rather than a technological challenge, and suggested those trying to develop new energy sources should first aim to increase public knowledge "so that technologies win the heart of the public and thereby shorten the time between first discussions and implementation" (Assefa and Frostell, 2007, p.76).

Kakoyannis et al. (2001) used a knowledge-based modeling approach to understand the social acceptability of natural resource decision-making processes. They determined that ignoring social acceptability in natural resource management decisions would slow down or prevent implementation of plans resulting from these decision-making processes. The factors they used as indicators of social acceptability included context, including the concept of place attachment, or sense of place; trust, both institutional and individual; risk, or perception of risk; knowledge, especially traditional or local knowledge; and values.

Brunson (1992) identified "communication pitfalls" as one of the difficulties of meaningful dialogue between natural resource professionals and the public. Specifically, the technical mind-set of professionals often inhibits understanding relationships between values and perception. Values give meaning to objects, and these meanings influence perceptions of activities that may affect these objects. In the context of natural resource management, Brunson (1992) highlighted substantial differences in the

preferred use of a natural resource according to the dominance of either spiritualist or utilitarian values of the user. In order to provide effective natural resource management, he stressed that the reality of different value systems must be acknowledged.

Importance of Place Attachment

Along with Kakoyannis et al. (2001), other studies determined the importance of the concept of place attachment when working with local communities. Lai and Kreuter (2012) studied environmental change and place attachment in the Hill Country of Texas. Place attachment was described as peoples' attachments to their homes, and relationships with and connections to, their environment tied to a specific geographic location. They described three dimensions of place attachment which included: (1) place dependence, or the functions and features of the natural environment; (2) place identity, the emotional or spiritual ties to the place; and (3) social bonding, or the meaningful interactions with family and friends who share the place, or community. While their study focused on land management decisions and the assertion that landowners' evaluations of change interacted with these three dimensions of place attachment, they determined that aspects of place attachment were important considerations during new development. This underscores the need for stakeholder participation and communication to clarify how new developments within the locality will not adversely affect place attachment.

Brunsting et al. (2011a) in their study of the effects of communication strategies on public attitudes and technology perception found that successful projects recognized and addressed the concept of place attachment. They discussed the importance of

communication and participation in the context of what they referred to as "local realities." Developers need to be aware that a sense of place attachment may lead the local people to perceive that a new energy project, even though supported in general, may be detrimental to the local environment. Brunsting et al. (2011b) also noted place attachment can produce dichotomous technological-economic and social-local perspectives, and therefore differences between a locality's general perceptions about a technology and perceptions about a specific local project. They pointed out that perspectives were "just lenses through which people view reality" (Brunsting et al., 2011b, p. 6381).While neither perspective should be considered right or wrong, not acknowledging the local perspective can frequently lead to conflict and deadlock.

Theodori (2004) conducted a study on place attachment, which he referred to as community attachment/satisfaction, and found higher levels of community attachment resulted in an increased level of community action. He determined it was important for developers to know and understand how community attachment can help or hinder new development.

The Communication Process

The preceding studies determined the importance of understanding how communities perceive new developments, and their concerns about how developments may affect local environments. Other studies have evaluated the effect of the way new information is communicated to the public on development outcomes.

Rabinovich et al. (2012) suggested that recipients' beliefs about the motives of the individual or groups delivering the message affected how the message was received.

Motives could be perceived as to either inform or persuade recipients. They determined that if the recipients of a message suspected there was a hidden agenda, they resisted any forms of persuasion.

In their study of public opinion of carbon capture and storage in the Netherlands, de Best-Waldhober et al. (2012) discussed how an increase in public awareness did not necessarily lead to an increase in public knowledge. They suggested researchers must understand not only what the public knows, but also how that knowledge was gained. They also suggested, when communicating new knowledge, the public's level of awareness needs to be taken into account. However, at the same time, information needs to be presented in a way that can also be readily understood by those who are unfamiliar with the issue.

Brunsting et al. (2011a, 2011b, 2011c) also conducted several studies about the communication process and public perceptions of carbon capture and storage in the Netherlands. Like other studies, they documented the importance of early consultation with the public, acknowledging effects of place attachment, and proactively providing enough information for the public to make informed decisions. Their studies also demonstrated the importance of building trust in the project developer and the individual or group who communicates the information. If the public felt the developers' main motives were profit and self-interest, their perceptions of the truthfulness of the information was negatively affected.

Knowledge was one of the indicators of social acceptance used in many studies, and increasing knowledge was seen as a means of increasing social acceptance (Assefa

and Frostell, 2007; Greenberg, 2009; Kakoyannis et al., 2001). Other studies (Brunsting et al., 2011a; de Best-Waldhober et al., 2012) also determined the importance of providing information to the public to enable them to make informed decisions.

Research Question and Hypothesis

The key question addressed in this chapter was: Do respondents' self-reported knowledge, perceptions, and concerns concerning a new type of energy (LTGE) change after reading a brief informative description of it? The associated hypothesis was:

H1: After reading a brief factual description of geothermal energy, respondents' acceptance/positive perceptions of geothermal energy will increase from the level it was before reading this information.

Methods

Study Area

Matagorda County, Texas was chosen for this study due to its atypical relationship with different types of energy development. Oil and gas development has been present in the County for over one hundred years; and it is one of only two counties in the State to have an operating nuclear power plant (South Texas Project - STP, which has been online since 1988). Additionally, there was a recent attempt to build a coal-fired electricity plant there, which failed, largely due to local opposition (No Coal Coalition, 2013). The County is also located in an area of Texas that has been shown to have high potential for LTGE development (State Energy Conservation Office - SECO, 2015) (Figure 2). With its location on the Gulf of Mexico, with rivers, bays, wildlife

refuges, and a barrier island within its borders, Matagorda County is also considered an environmentally sensitive area (Figure 1).

Mail Survey

In order to develop a questionnaire that addressed the issues of energy development among Matagorda County residents, key informant interviews and focus groups were conducted. These are methods commonly used to understand community concerns (Sangaramoorthy, et al. 2016; Theodori, et al. 2009). A mail survey questionnaire was then developed to explore survey participants' perceptions of various energy types: oil and gas, nuclear, coal, wind, solar, and geothermal energy. This was achieved by asking participants to respond to a set of four statements for each type of energy (Table 3). Once respondents provided their opinions about geothermal energy, they were asked to read a brief description of it, and then answer the same questions about LTGE again. They were also asked if they felt they had any input into energy development in their County, and if they would be willing to participate in a local group to discuss energy development. Respondents were also asked to provide comments they may have regarding each type of energy. The questionnaire also presented two scales to determine respondents' values: the Schwartz Portrait Values Questionnaire (PVQ) and the New Ecological Paradigm (NEP). It also included demographic questions, and asked whether or not the participants had any alternative or renewable energy on their property.

The mail survey was conducted using five mailings over a six-week period (Dillman 2007). The survey was conducted between August 2014 and March 2015 and

consisted of five mailings including: a pre-survey notification letter (day 1); survey questionnaire with a cover letter (day 7); thank you/reminder postcard (day 14); replacement questionnaire with second cover letter for non-respondents (day 28); and final thank you/ reminder card (day 42). Mailings were initially sent to 800 randomly selected addresses obtained from a survey research company, SSI – Survey Sampling International. Due to the high proportion of bad addresses (almost 21%) and low response rate, a second set of mailings was sent to an additional 500 addresses in November 2014, following the identical research protocol. However, due to year-end holidays, the timing between mail-outs differed slightly as follows: pre-survey notification letter went out on day 1; the survey questionnaire with cover letter went out on day 14; the first thank you/reminder postcard went out on day 21; a replacement questionnaire with a second cover letter for non-respondents went out on day 46; and the final thank you/ reminder card went out on day 61.

Data Analysis

Survey data were entered into a Microsoft Excel spreadsheet and analyzed using STATA 13.1 (StataCorp, 2015). Statistical analyses included descriptive statistics for demographic data, frequency distributions, and Chi-square tests to determine whether there were significant changes between indicators of social acceptance before and after survey respondents read the short informational message about geothermal energy.

Like Assefa and Frostell (2007), the indicators of social acceptance used in this study were self-described knowledge, perceptions, and fears (worries or concerns). Respondents' energy preferences were determined based upon their indicators of social

acceptance, hereafter referred to as "perceptions." Responses were divided into categories of "positive perception" (mildly or strongly agree) and "negative perception" (mildly or strongly disagree). Responses marked "unsure" were summed separately. A positive "perception" was then considered a "preference" for that energy type. Self-reported knowledge was quantified separately from the other three statements in Table 3 since individuals could consider themselves to be knowledgeable about an energy type but still rank it negatively.

Results

The two mail surveys consisted of 1,300 questionnaires being mailed out. Of these, 278 were returned as undeliverable, resulting in an effective sample size of 1,022 Matagorda County residents. Overall, 316 responses were received, resulting in a raw response rate of 31%. However, 42 of the returned questionnaires were not completed for various reasons, leaving 274 useable completed questionnaires, which represent a useable response rate of 27%. This response resulted in a sampling error of 6% with a confidence level of 95%. Time and budgetary constraints prevented the inclusion of a follow-up non-response bias survey and analysis. While this may have limited the extrapolative power of the research results to the whole population, it did offer an initial explorative examination of research objectives and hypotheses.

Respondent Profiles

The length of time survey respondents lived in Matagorda County ranged from two months to 86 years with a median value of 32 years and a mean value of 34 years (SD = 21.73). Respondents were predominantly male (61.5%) ranging in age from 22 to

91 years with a mean age of 59 (SD = 14.4), and 86% of them owned property in Matagorda County. The majority (83.5%) were White, followed by Hispanic (9.4%). Some respondents had college training or were college graduates (29.0% and 27.4%, respectively). Forty percent (40%) were employed full-time, 33.2% were retired, and 9% were self-employed. Income ranged from < $15,000 to > $100,000 (34.4%). When asked if respondents or family members worked in the various industries, results were: oil and gas - 91 (34%), nuclear - 90 (33%), wind - 7 (3%) and coal 4 (2%). No one worked in the solar industry. Geothermal was not a category since it currently does not exist within the County. Eighteen respondents (7%) indicated they had some form of alternative or renewable energy generation on their property in Matagorda County or elsewhere, including solar, wind, and one heat pump. One respondent indicated plans to install solar panels; one stated they "would love to" have alternative energy; one said it was "too expensive;" and one said, "I have looked at feasibility of wind."

Value Scales

The results of the PVQ and NEP value scale are reported in detail in Chapters 2 and 3. Overall, for value set, the median scores of the respondents was highest for the Self-Transcendence value set (4.97), followed by Conservation (4.70), and Openness to Change (4.51). The fewest number of respondents scored highest on the Self-Enhancement value set (2.95) (Table 6). A majority of the respondents (70%) scored high on the NEP, which indicated an endorsement of a more environmentally conscious worldview (Table 8).

Indicators of Social Acceptance and Respondents' Self-Reported Knowledge

Respondents had predominantly positive perceptions for solar (75%), wind (73%), nuclear (66%), and oil and gas (63%) energy. By contrast, the dominant perception regarding coal energy (52%) was negative, while respondents were predominantly (55%) unsure about geothermal energy (Table 4).

For all types of energy, a high degree of self-reported knowledge was a significant predictor of energy acceptance. This is consistent with Assefa and Frostell's (2007) conclusion that gaining more knowledge and familiarity with an energy source may lead to a higher degree of acceptance of that energy. Regarding geothermal energy, 70% of respondents did not feel they knew enough about this energy source to be accepting of it: 46% disagreed with the statement, "I consider myself knowledgeable about geothermal energy," and 24% were unsure. Table 5 shows the results of self-described knowledge for all energy types.

Differences in Perceptions Before and After Reading Description

After respondents provided their opinions about geothermal energy, they were asked to read a brief description of it (Questionnaire, Appendix A, p.5), and again answer the same questions about LTGE. This was done to determine the extent to which their opinions about this energy type may have changed after reading a short informational message. Answering the questions a second time, many respondents indicated they still didn't know enough, or were unsure if they knew enough, about geothermal energy to form an opinion (Table 14). However, most respondents did

Table 14. Opinions regarding geothermal energy before and after reading an informational description

Question	**Response Choice**				
	Strongly Disagree	Mildly Disagree	Unsure	Mildly Agree	Strongly Agree
I consider myself knowledgeable about geothermal energy.					
Initial Response	26%	20%	24%	25%	5%
After Reading Description	12%	16%	7%	23%	42%
$\chi^2 = 72.78$, $p < 0.001$					
I think geothermal energy could be an asset to Matagorda County.					
Initial Response	3%	3%	54%	25%	15%
After Reading Description	3%	3%	32%	41%	21%
$\chi^2 = 63.46$, $p < 0.001$					
I do not worry about the safety of geothermal energy development in Matagorda County.					
Initial Response	7%	8%	54%	18%	13%
After Reading Description	7%	9%	42%	25%	17%
$\chi^2 = 16.78$, $p = 0.002$					
I believe that geothermal energy is not harmful to the environment.					
Initial Response	3%	7%	58%	17%	15%
After Reading Description	3%	9%	46%	24%	18%
$\chi^2 = 18.10$, $p = 0.001$					

change their opinion somewhat. Figures 5 and 6 depict these differences graphically, with Figure 5 clearly highlighting the response frequency distribution had moved to the right, i.e., toward a more "positive perception." Figure 6 illustrates each statement separately. Chi-square tests indicated that each of these shifts were significant (Table 14) thereby corroborating H1: *After reading a brief factual description of geothermal energy, respondents' acceptance and/or positive perceptions of geothermal energy will increase from the level it was before reading this information.* This suggested that, if

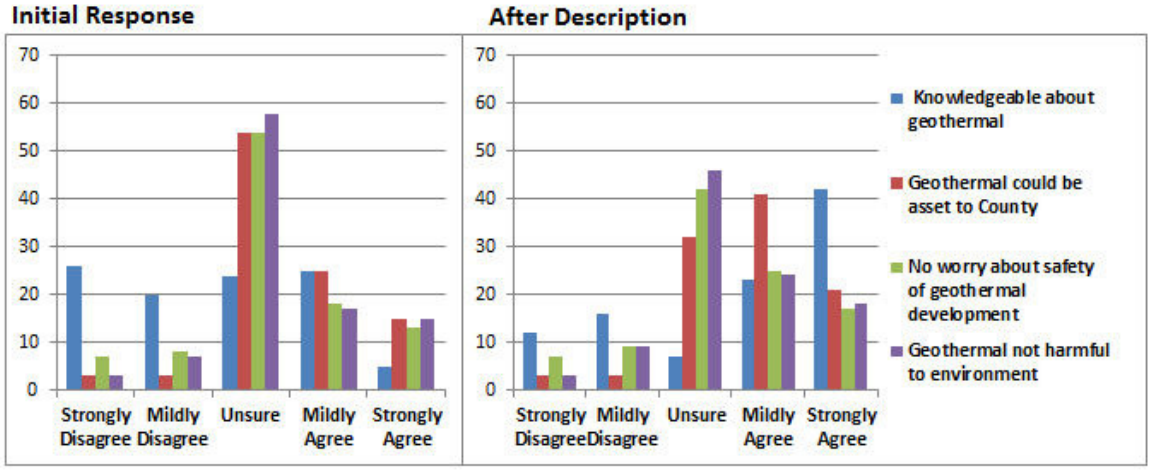

Figure 5. Overall comparison of opinions regarding geothermal energy before and after reading an informational description.

energy industry or local leaders were considering developing geothermal energy resources within the County, they should present factual information about the energy source in a timely manner. This may enable County residents to learn and make up their minds based upon facts, rather than waiting until they have been exposed to information from resources that may be less than reliable.

Perceptions Regarding Local Input

Participants were asked whether they felt they have any input into what types of energy development will occur in Matagorda County. Those that lived in Matagorda County before the South Texas Project nuclear plant was built were asked if they felt they had any input about the development of that plant in the County. Of the respondents, 61% stated they did not recall, did not live in the County then, or were too young at the time, and 10% did not answer the question. Of those with an opinion, 21, or

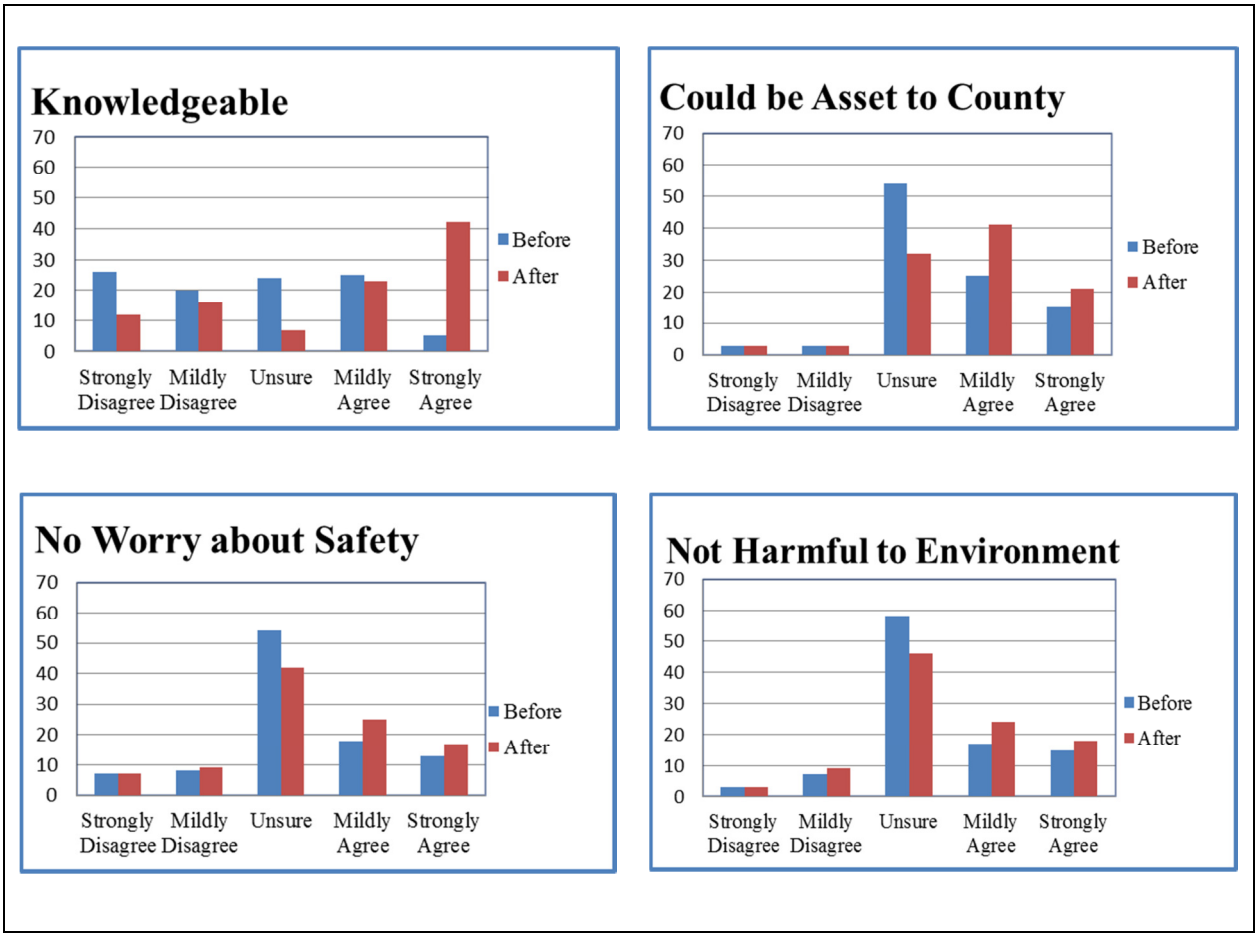

Figure 6. Individual comparison of each opinion regarding geothermal energy before and after reading an informational description.

7% felt they did have input about building the plant in Matagorda, and 62, or 22% stated they felt they did not have any input about the building of the plant.

When participants were asked if they had ever been active in any community groups regarding energy development in Matagorda County, only 9% responded “yes”, 84% responded “no”, and the remaining 7% did not answer the question. When participants were asked if they would be willing to be part of a future community group

to discuss the possible development of new forms of renewable energy in Matagorda County if the situation ever arose, 58% said "yes" and 42% said "no."

Statistical tests were conducted to determine if there were any significant associations between respondents who stated their willingness to participate in a community discussion and demographic factors (two-sample t-test for age, and chi-square test for the other factors). No significant associations were found between willingness to participate in a community group and age, sex, employment status, and property ownership in Matagorda County. However, willingness to participate in a community discussion was positively associated with level of income ($\chi^2 = 13.32$, and $p = 0.038$) and level of education ($\chi^2 = 18.20$, and $p = 0.011$). This study and Theodori (2004) demonstrated the importance of including diverse individuals in any pre-development planning meetings. Another significant factor positively associated with willingness to participate in community discussions about energy development was having a form of alternative or renewable energy generation on their property ($\chi^2 = 9.91$, and $p = 0.002$).

Discussion

The results of this study indicated individuals need information about an energy type or a development project before they can develop positive perceptions about it. These results are supported by other studies that have shown the importance of self-reported knowledge of new types of energy before social acceptance can occur (Assefa and Frostell, 2007; Greenberg, 2009; Kakoyannis et al., 2001). This study found when respondents felt they did not have enough knowledge about LTGE, their perceptions

about it were uncertain. After gaining some knowledge by reading an informational piece, self-reported knowledge and positive perceptions about LTGE increased. This study furthered the current knowledge base by finding that even though LTGE was presented as a new source of renewable energy, respondents were not willing to blindly accept it. This suggested that an energy source cannot simply be presented as "renewable" to gain acceptance, even to a group with an environmental orientation. Rather, perceived individual knowledge about an energy source seems to be a critical determinant of its acceptance.

While these results address the importance of knowledge, they do not address the importance of the communication process. The questionnaire was mailed from Texas A&M University and was presented as a research project, so there was likely little suspicion about the motives behind the message being delivered. Texas A&M University is a well-respected university throughout the state, so those who responded were most likely familiar with the institution. In a real-world scenario of energy development, the individual or group delivering the message of LTGE would first have to build trust with the local people, and make sure there was no perception of hidden motives (Rabinovich et al., 2012). All of the information sent to participants stated the questionnaire was for a Texas A&M research project. In spite of that, one respondent still questioned the possibility of hidden motives and wrote:

> *"One thing you did not provide is, who is paying for this survey. I would have liked to know this information. This way I could know who will put the correct spin on the survey results to benefit them."*

One concern reiterated by participants and respondents was agreement with the fact that Matagorda County was an environmentally sensitive area, and residents were not willing to risk the environment for economic gain. The results of this study emphasized results shown from other studies that found early consultation with the local public is necessary. Also, those delivering the message should take into account local values and degrees of place attachment (Brunsting et al., 2011a; Lai and Kreuter, 2012; Theodori, 2004).

Unsuccessful energy development projects have commonly exhibited a lack of early local public participation and transparency (Brunsting et al., 2011a; de Best-Waldhober et al., 2012). Local residents wanted to be involved in the process. However, as this and other studies have concluded, discussions of future local development should include not just residents who have voiced strong place attachment, but should be more inclusive and also include other stakeholders of varying demographics.

Conclusion

This study and others have shown that it is in the developers' best interest to determine the values, concerns, and common interests of members of the local public before committing significant financial investments in the development of new large-scale energy. These projects may otherwise fail due to legal challenges from dissatisfied communities and/or conservation groups. As with other large-scale management decisions, inclusiveness of stakeholders is more likely to result in positive outcomes than imposed top-down decision-making.

Despite low response rate and the lack of a non-response bias analysis, resulting in the limited extrapolative power of this research as discussed earlier, several key findings have implications for energy development policy in environmentally sensitive coastal areas, and other areas considering new development. One of the main findings was that stakeholders want to be informed early on in the process. Stakeholders also need to feel they have some unbiased knowledge of the type of development being proposed before they can accept and embrace it within their locality. Along with knowledge, trust is a vital issue. This is especially important when investors and facility owners are community outsiders. Local community members must feel confident with the aims, attitudes, and competence of those bringing in the new development. Failure to involve local communities from the onset of any new development projects will often lead to conflict and delays that may have been avoided by transparency and inclusive local input.

CHAPTER V

SUMMARY AND GUIDELINES FOR COMMUNITY DIALOGUES

Overview

This final chapter summarizes the dissertation, and then describes lessons learned. The lessons learned include summaries of several examples of projects beset with difficulty in acceptance, and others that successfully followed these lessons. Finally, guidelines that can be used for development of new energy sources within communities are provided.

Summary of Study

When new types of energy development are proposed, people often have pre-conceived notions, and may then take positions that are not supported by facts. This study addressed this fundamental problem. Too often new information is rejected out of hand based on pre-conceived opinions formed by something read on the internet, watched in a movie, or heard from a third party. However, if new information can be presented in a manner that aligns with an individual's value set, the individual may be more willing to consider that new information and then make a knowledge-based decision. This study questioned whether framing new information in a manner that was congruent with an individual's values and/or environmental orientation would make the individual more predisposed to listen to factual information. This could then enable them to make decisions based on knowledge rather than other pre-conceived notions.

The specific objective of this research was to address the social dimensions of producing low-temperature geothermal energy (LTGE) within the boundaries of an environmentally sensitive area. This information provided guidelines that parties of the energy development vs. community and quality of life dispute might use as a first step to avoid conflict.

While most of the studies cited throughout this research project examined values as predictors of environmental *behavior,* this study looked at the possibility of values as predictors of *perceptions or attitudes* concerning environmental issues. This dissertation research focused on local perceptions of energy development and what role, if any, values and environmental orientation had in perception of or preference for different types of energy. Also examined was whether framing new information in a manner that was compatible with various value sets or environmental orientations affected how that message was received. This study also investigated whether receiving unbiased information about a new energy type, low-temperature geothermal energy, would affect how that energy was perceived.

A mail survey was conducted to study local perceptions of energy development. Using the theoretical frameworks provided by values and framing theories, five primary questions were examined in the chapters of this dissertation including:

1) Is value orientation related to environmental orientation?

2) Does value orientation affect perception of and/or preference for various energy types (including both conventional and renewable energies)?

3) Does environmental orientation affect perception of and/or preference for various energy types (including both conventional and renewable energies)?

4) Does framing a benefit of a new type of energy (LTGE) with respect to a person's value orientation and/or environmental orientation make that statement more appealing than a statement framed in a manner that is not compatible with an individual's values or environmental orientation?

5) Does a respondent's self-reported knowledge, perceptions, and concerns concerning a new type of energy (LTGE) change after reading a brief, fact-based, informative description of it?

Below are summaries of these five key questions, the primary results, and conclusions from this research.

1) Is value orientation related to environmental orientation?

Chapter II determined the value set and environmental orientation of survey participants in Matagorda County, Texas. This was done through the use of two scales, the Schwartz Portrait Values Questionnaire (PVQ) to determine respondents' value set, and the New Ecological Paradigm (NEP) to determine respondents' environmental orientation. High NEP scores were expected to be positively associated with self-expansive values (Openness to Change and Self-Transcendence values) and negatively associated with self-protective values (Self-Enhancement and Conservation). A positive relationship ($p = < .001$) existed between Self-Transcendence values and NEP, and a negative relationship ($p = .001$) existed between Conservation values and NEP. These results only partially supported study hypotheses. While the expected positive and

negative associations existed between the other two values (Openness to Change and Self-Enhancement, respectively) and NEP, they were not statistically significant.

A unique finding of this study was that the significant relationships that did exist were between NEP, and values on the bottom half of Schwartz's value structure grid, the social focus values (Figure 4). These social focus values (Conservation and Self-Transcendence) regulate how one relates socially to others. This is contrary to previous studies (Grob, 1995; Karp, 1996; Schultz and Zelezny, 1999), which found relationships between environmental attitude and values on the right half of Schwartz value structure grid, those with a self-expansive focus. This study's results implied that new information concerning possible new energy development should be presented in a manner that highlights the social benefits of this possible development. This would include how new development could benefit both Conservation values (i.e., offer security by helping maintain cultures and traditions that make the community a desirable place to live) and Self-Transcendence values (i.e., how the proposed development will not harm the environment and will benefit the community as a whole).

Chapter II also reported on respondents' perceptions of and preferences for each of six energy types including: oil and gas, nuclear, coal, solar, wind, and geothermal, using a series of questions designed to measure indicators of social acceptance. Respondents had predominantly positive perceptions for solar (75%), wind (73%), nuclear (66%), and oil and gas (63%) energy. The dominant perception regarding coal energy was negative, and respondents were predominantly unsure about geothermal

energy. They also considered themselves to be knowledgeable about all but geothermal energy.

After determining value sets and energy perceptions, this study sought to determine if value orientation affected perception of the various energy types. Specifically, the second and third research questions asked if any relationships existed between value orientation and/or environmental orientation and preference for energy type. Question 2 asked:

2) Does value orientation affect perception of and/or preference for various energy types (including conventional energies and renewable energies)?

Previous research found correlations between energy preference and values on either side of the left-right axis of Schwartz's value structure grid (Figure 4), i.e., those values with a self-protective versus self-expansive focus. These included positive associations between Conservation values and nuclear energy preference, and negative associations between Conservation values and wind energy preference (Bidwell, 2013; Whitfield et al., 2009). Other studies found negative correlations between Self-Enhancement values and environmental concern (Karp, 1996; Stern et al., 1995). Conservation and Self-Enhancement values are both self-protective values.

Previous research also found positive relationships between the values of Openness to Change and Self-Transcendence and wind energy, and negative relationships between these values and nuclear energy (Bidwell, 2013; Toke and Strachan, 2006; Whitfield et al., 2009). Openness to Change and Self-Transcendence are both self-expansive values.

It was expected that this study would yield similar associations. Therefore, the self-protective values (Self-Enhancement and Conservation) were expected to be positively associated with a preference for conventional energy sources, and negatively associated with a preference for renewable energy sources. Additionally, the self-expansive values (Openness to Change and Self-Transcendence) were expected to be positively associated with a preference for renewable energy sources, and negatively associated with a preference for conventional energy sources. The data only partially supported this. Results found a positive and significant association between Conservation and acceptance of the conventional energy sources of oil and gas ($p = .01$) and nuclear energy ($p = .01$), but not coal. Results also found a statistically significant negative correlation between Self-Transcendence and oil and gas ($p = .03$), but no correlation with the other two conventional energy sources. There was no support for an association between any of the values and preference for renewable energy sources.

Similar to the results discussed above for Question 1, the other studies focused on relationships with values on the left-right axis. This study found that the significant relationships that did exist between values and energy preference involved only values on the bottom half of Schwartz's value structure grid, i.e., the social focus values. This may offer a different way to view value clusters and how they relate to energy preferences, and further research should focus on this aspect of the Schwartz's value structure grid. However, since there were only three statistically significant associations between energy preference and value types, the implications are that value categories do not appear to be overall good indicators of energy preference.

Along with determining whether any relationships existed between value orientation and energy preference, Chapter II also examined the association between environmental attitude and energy preference. To address this, Question 3 asked:

3) Does environmental orientation affect perception of and/or preference for various energy types (including conventional energies and renewable energies)?

Previous studies found a positive relationship between high NEP scores and support for wind energy, and low NEP scores and support for nuclear energy (Bidwell, 2013; Whitfield et al., 2009). Therefore, it was expected that high NEP scores (a more ecocentric orientation) would be positively associated with acceptance of renewable energy sources and negatively associated with conventional energy sources. Results showed a statistically positive association between NEP and wind ($p = .010$), as well as solar energy ($p = <.001$), both of which are renewable energy sources. However, geothermal energy was also presented as a renewable energy source but was not found to be associated with high NEP scores.

Other studies also showed negative correlations between NEP and nuclear energy (Bidwell, 2013; Dietz and Shwom, 2005; Whitfield et al., 2009). This study therefore, expected to find negative correlations between high NEP scores and preference for conventional energy sources, including nuclear energy. However, this study did find not the expected negative correlation between NEP and nuclear energy. The expected negative correlation between high NEP scores and other conventional energy types also did not exist. In fact, there were no associations found between environmental orientation and conventional energy sources.

The majority of the survey respondents had high NEP scores (70%). While this produced the expected positive perceptions of wind and solar power, respondents also deemed oil and gas and nuclear power to be acceptable forms of energy. This may be because the respondents resided in a county that has had a long and positive history with both oil and gas and nuclear energy. Self-reported knowledge about an energy type was also a positive determinant in the acceptance of that type of energy. It appeared that respondents' knowledge of oil and gas and nuclear energy were more important determinants of acceptance of these conventional energy projects sources when compared to a pro-environmental orientation.

This study's results indicated that while values may not be good indicators of energy preference, pro-NEP orientation (as measured by high NEP scores) might be a good indicator of preference for renewable energy types. Results, however, also supported the idea that when trying to develop a new energy source, the first step should be to increase the public's knowledge (Assefa and Frostell, 2007). The results implied that while awareness of a community's environmental orientation may be helpful in determining how to present new information, providing information is the most important aspect. Regardless of a community's overall environmental orientation, it is important to increase perceived knowledge by providing unbiased information. A community's overall environmental orientation may make them more likely be open to either renewable or conventional energy development. However, a more important factor is that its members consider themselves knowledgeable about the new energy source.

Merely labeling an energy source conventional or renewable, will not necessarily guarantee acceptance.

Chapter III focused on framing as a communication tool and asked the question:

4) Does framing a benefit of a new type of energy (LTGE) with respect to a person's value orientation and/or environmental orientation make that statement more appealing than a statement framed in a manner that is not congruent with that individual's values or environmental orientation?

This chapter sought to determine if framing could be used as a communication tool to impart information in a manner that would allow recipients to be more receptive to new information. This would enable them to make an informed decision rather than dismissing new information out of hand due to pre-conceived positions. As noted by Wondolleck et al. (2003), when people feel that their values or beliefs are threatened or challenged, they tend to lock into a position, making them less open to different points of view. Framing techniques can be used to ease people out of these locked positions and find a common ground, or common language, to facilitate communication. Locked positions can be converted to common interests, which can create a commonality, and produce a more constructive approach to conflict management and resolution.

It was expected that framing information about a relatively unknown type of energy, LTGE, with respect to a person's value type or environmental attitude would make that statement more appealing than one framed in an incongruent manner (Table 11). The results were mixed. Some of the statements framed for the four values were supported while others were not (Tables 12a and 12b). Framing a message based upon

an individual's environmental orientation was more consistent with the expected results (Tables 13a and 13b). Two scales were used to determine if either scale was more indicative of perceptions regarding energy development, and if either was more amenable to the use of framing techniques. The NEP was easier to administer and score, and may be a better option for LTGE proponents seeking to inform the public about the development of this new energy type.

There were limitations due to an apparent confusion among survey respondents about the concept of ranking, and the necessarily subjective nature of designing the statements, as discussed in Chapter III. Overall, framing a message concerning a new type of energy influenced how that message was received. Therefore, when presenting new information about a possible new type of energy development, it would be most effective for new information to be presented in a manner that matches the values of the community members, including their environmental orientation. It is in the developers' best interest to determine the values of the community members, and where members' common interests lie regarding what they perceive to be best for their community. This should be done before committing to significant financial investments in the development of new large-scale energy projects. These projects may otherwise fail due to legal challenges from dissatisfied communities and/or conservation groups. As with other large-scale management decisions, inclusiveness of stakeholders is more likely to result in positive outcomes than imposed top-down decision-making.

Chapter IV sought to determine if being presented with information regarding LTGE affected respondents' self-reported knowledge and perceptions, and asked the

question:

5) Does a respondent's self-reported knowledge, perceptions, and concerns concerning a new type of energy (LTGE) change after reading a brief, fact-based, informative description of it?

As reported in Chapter IV, after reading a brief factual description of LTGE, respondents reported a significantly more positive perception of this energy source (Table 14, Figures 5 and 6). While many of the respondents remained negative or unsure about geothermal energy, the short message resulted in more positive attitudes. It was clear that individuals needed to feel they were knowledgeable about a new type of energy or a proposed development project before they could accept and embrace it within their community. These results were supported by other studies that revealed the importance of self-reported knowledge of new types of energy before social acceptance can occur (Assefa and Frostell, 2007; Greenberg, 2009; Kakoyannis et al., 2001).

When respondents felt they did not have enough knowledge about geothermal energy, their main perception of it was uncertainty. After gaining some knowledge by reading an informational piece, self-reported knowledge and positive perceptions about LTGE increased. Study results made it clear that stakeholders want to be informed early on, with unbiased information, and need to feel they are knowledgeable about any proposed type of development before they can accept it. Those delivering the message should work on building trust with the community, and also take into account local values and degrees of place attachment.

This final chapter of the dissertation utilized the results from the previous three chapters to create a set of guidelines that can be used by both communities and those wishing to bring new energy development to communities. The guidelines can be considered "successful energy transition strategies" for those involved in energy and other economic development. Experience has shown that when parties involved in development consciously followed such strategies, or when past experience taught those parties correct procedures, successful projects followed most of the guidelines (van de Velden and Schildmeijer, 2015). Unsuccessful projects likely fell victim to organized opposition or lack of effective, preemptive, comprehensive, and open information campaigns by energy resources developers.

This next section distills observations from previous studies and this research to provide guidelines for those who are seeking to introduce new concepts and technology to communities and community residents. Some of these guidelines are listed below:

- **Avoid Current Process of "Decide, Announce, and Defend:**" New development occasionally begins with a small meeting involving a few select community leaders held behind closed doors. Developers and leaders discuss the new project and "decide" to proceed with it. They obtain the necessary permits and paperwork and then "announce" to the local community their intentions. Naturally, this leads affected stakeholders to feel they were excluded from the decision, which can result in conflict, divisiveness, and possible litigation. The developers are then left to "defend" their decision.

- **Involve Local Communities from the Onset:** Stakeholders want to be involved in the early discussions of the possibility of new developments that may affect them, and they preferred a bottom-up, rather than a top-down, development process.
- **Hold Small-group Focus Meetings:** Participants felt small groups created an environment that facilitated open discussion and minimized intimidation. Large town-hall type meetings often lead to domination by the more outspoken individuals. Wagner et al. (2013) in their study of collective action in wildlife management found smaller groups (less than 30 members) were most effective for building social capital through shared values.
- **Present "Whole Picture:"** Respondents wanted to hear both the pros and cons of any proposed development. They were concerned about how any development would affect the environmental attributes of their community, including water, land, and air. They felt that too often only the economic benefits were addressed, and adverse environmental possibilities were ignored. Respondents said they were not willing to spend community's natural capital (the biophysical benefits of an environmentally sensitive area) solely for economic gains.
- **Emphasize Process Rather Than Outcome:** Respondents wanted to feel as if their participation would genuinely make a difference. They wanted a process set in place where their opinions were actually taken into consideration.

While these guidelines may appear at first glance to be similar to recent guidelines developed by the energy industry (API 2014; DNV 2013; van de Velden and Schildmeijer, 2015), there are several key differences. Industry guidelines were

compilations of lessons learned, and remained focused on the business of energy extraction. They were derived, for the most part, from secondary sources, and primarily focused on technical solutions to communication issues. They also continue to promote the practice of "decide, announce, and defend" which frequently becomes the initial point of a conflict.

The guidelines included in this study were derived from actual communication and interaction with the public. They focused on the values of the community, rather than how to maintain business as usual. Industry guidelines are ultimately focused on how to make the project move more smoothly (from industry's point of view). Industry's expectation is that eventually the community's opinions will change and fall in line with theirs. The results of this study suggested that industry must occasionally accept the fact that a particular community is not going to be a good fit for their business. In these situations, industry should be willing to give up attempting to develop a project in that particular location, and move on to a different location that offers a better fit.

Case Studies of Various Energy Development Projects

Energy development worldwide has always been a large part of the economic development of countries and the well-being of its citizens. Regardless of importance, many projects have experienced delays and even cancellation when organized opposition developed. In support of the conclusions from this research, the following case histories corroborated lessons learned from this project.

Unsuccessful Carbon Capture and Storage (CCS) Project in Barendrecht, the Netherlands

In 2006, Shell began the permitting process for a CO_2 capture and storage demonstration project in two depleted gas fields under the Dutch town of Barendrecht. In 2007, Shell informed the Municipal government of the project, and in 2008 began to inform the local public. This is a classic example of the "decide, announce, and defend" process (Global CCS Institute, 2013). As time proceeded, opposition by both local government and local citizens increased. Along with concerns about safety and a possible loss in property values, citizens perceived the decision-making process as unfair, and cited a lack of trust in the decision-makers. They also felt that the citizens of Barendrecht and the local government should have had more influence in the decision-making process, and Shell and the national government should have less (Terwel et al., 2012). The project was cancelled by the Dutch government in November of 2010 due, in large part, to "complete lack of local support" (World Resources Institute, 2010, p.41).

Many research studies were conducted on the failure of the Barendrecht CCS project. As a result, Brunsting et al. (2011) developed a set of recommendations for future CCS projects that are similar to the guidelines developed from this research project.

Unsuccessful Coal-Fired Power Plant Project in Matagorda Texas

In 2008, the White Stallion Energy Center Project began filing permit applications for a coal-fired electric power generating station in Matagorda County, Texas. When local residents learned about the development, they voiced concerns about

the safety of the plant, its water usage in an area already struggling with limited water resources, and harmful air emissions. A local protest group was formed, and national groups, such as the Sierra Club and the Environmental Defense Fund, joined the debate. While many public forums were held, White Stallion's owner and CEO declined all invitations to participate (Sierra Club, 2013). Due to growing grassroots opposition, court challenges, and other factors, in 2013 White Stallion abandoned its plans to build the Matagorda County coal-fired power plant (No Coal Coalition, 2013). This is another instance of "decide, announce, and defend," where the local stakeholders were not involved or consulted from the outset, resulting in several years of growing opposition, legal challenges, and the ultimate abandonment of an energy development plan.

Troubled Geothermal Projects in Hawaii

Certain locations in Hawaii have long been considered ideal for geothermal energy, and development of this energy resource began nearly 40 years ago. Since then, development has been met with both open arms and ongoing protests. In an article in HawaiiBusiness.com (2010), discussing "Geothermal's Second Chance," Big Island Mayor Billy Kenoi said "But it has to be done right this time. ... The lesson here is: Talking builds trust. You cannot rush. … The more time and effort you put in on the front end, the easier it is, the more collaborative and cooperative it is on the back end." Attempts are being made by local groups to develop a better business model for geothermal development that encourages community partnerships and benefit sharing.

Successful New Zealand Geothermal Development and the Mauri Model

New Zealand is another location suited for geothermal development. However,

much of the undeveloped geothermal potential is located on land owned by Maoris, the indigenous people of New Zealand. Maori values and worldview have long been legally recognized in New Zealand (Pryor, 2010). In order to develop this geothermal potential while respecting the Maoris' values and worldviews, a decision-making tool, known as the Mauri Model, was developed and used to assess the effects of development on people and places (Gibson et al., 2015). The Maori worldview gives as much weight to cultural and social well-being as it does to economic and environmental considerations. The Mauri Model provided a framework that recognized this worldview, and compared and measured the cultural impacts of power plant development together with engineering and economic factors. According to Gibson et al. (2015), these principles can be readily applied to sustainable geothermal projects in other areas worldwide.

Importance of Pre-Development Research

Based upon the research, this study is advocating that pre-development research is essential for developers of new energy resources. "Pre-development research" is defined as an effort by developers to first communicate with the local residents and determine their needs. Such considerations should address several questions, including: (1) "What positive and negative effects will the proposed development have for the affected community?" (2) "What will the project cost the community in terms of environmental change and loss of natural capital?" (3) "Will the project require a substantial change in attitudes within the community, and if so, is the developer willing to attempt this change, *and* is this change even possible?" Additionally, developers should ask themselves several questions before beginning a project, including:

- Am I willing to meet early with community members and determine common interests?
- Am I willing to speak to the entire community rather than just the leaders or a few select spokespersons?
- Am I willing to take the time to determine the needs and values of the community?
- Am I willing to provide the community with full and factual information, sharing both the positive and any possible negative aspects of my project?
- Am I willing to listen to stakeholders and address their needs and concerns?
- Am I willing to work closely with the community and local stakeholders and give them a voice in the decision-making process from the start of the energy development project?
- Am I willing to make the community members part of the process, allowing them to assist in the development and adoption of new technologies that affect their community?
- Does my plan meet the environmental needs of the community and not spend environmental capital in order to gain a profit?
- Does my project meet the cultural and social needs of the community, taking their values into account?
- Can my project become a welcome entity within the community?
- Will my company be a good corporate neighbor?
- Will my project bring more to the community than just a few jobs?

- If I cannot find a common ground with the community with which to move forward, am I willing to walk away and try to find another community elsewhere where there may be a better fit?

The results of this study showed that self-described knowledge of an energy type positively correlates with acceptance of that energy. It was determined that knowing the environmental attitude of stakeholders was helpful so that new information about an energy type or development could be framed in a manner that was most meaningful to them. When presenting new information about a possible new type of energy development, it would be most effective if presented in a manner that related to the values of the community, and included their environmental orientation. It is in a developers' best interest to determine the values of the community members, and where members' common interests lie about what they perceive to be best for their community. In short, it is imperative that those who seek to bring development (change) to a community should spend significant time in communicating in an open fashion with its members and involve them in the decision making process from the start of an energy development project.

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APPENDIX A

MAIL SURVEY QUESTIONNAIRE

LOW-TEMPERATURE GEOTHERMAL and OTHER ENERGY DEVELOPMENT in MATAGORDA COUNTY

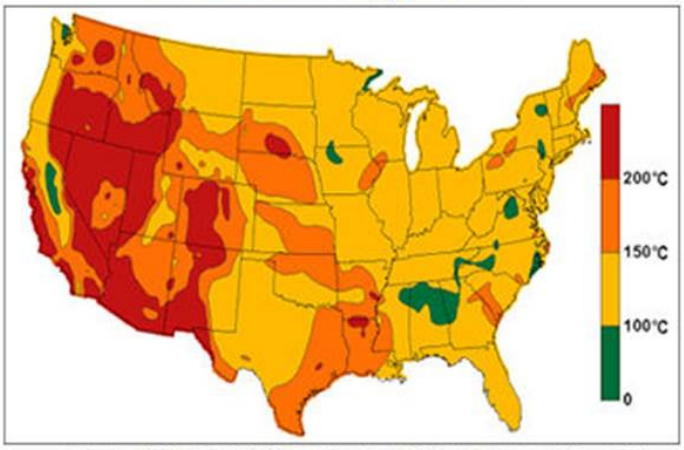
A SURVEY OF YOUR OPINIONS

Mad Island Marsh, Matagorda County

Matagorda County Ranch Land

Gulf Of Mexico, Matagorda County

US Geothermal Energy Potential



Source: US Department of Energy, Energy Efficiency & Renewable Energy

Department of Ecosystem Science & Management
Texas A&M University
Summer 2014

Texas A&M University is conducting this study to determine community perceptions of energy development in environmentally sensitive areas.

The purpose of this questionnaire is to ask you about your knowledge, perspectives, interests, and concerns regarding the development of low-temperature geothermal energy, and other types of energy development, in an environmentally sensitive area such as Matagorda County.

Along with your opinions on energy development, this study is also interested in your opinions on general environmental issues, and things that may be important to you as an individual.

Please answer all of the questions in this questionnaire. There are no right or wrong answers and ALL ANSWERS WILL REMAIN CONFIDENTIAL. When you have completed the questionnaire, please return it in the self-addressed postage paid envelope.

Do you live in Matagorda County? [ ] Yes [ ] No

If NO, please stop here and return the questionnaire in the self-addressed postage paid envelope.

If YES, please continue:

How long have you lived in Matagorda County?

Number of years: _____ years

Less than one year: _____ months

SECTION A: This first set of items concerns your opinions about different types of energy.

For each statement regarding **oil and gas** development, please indicate to what extent you agree or disagree by checking one of the boxes to the right:

Statements	Strongly Disagree	Mildly Disagree	Unsure	Mildly Agree	Strongly Agree
1. I consider myself knowledgeable about **oil and gas** development.	□	□	□	□	□
2. I think the **oil and gas** industry is a positive asset to Matagorda County.	□	□	□	□	□
3. I do not worry about the safety of the **oil and gas** industry in Matagorda County.	□	□	□	□	□
4. I believe that **oil and gas** extraction is not harmful to the environment.	□	□	□	□	□

5. Do you have any oil or gas development on your property in Matagorda County or elsewhere?
   [ ] Yes [ ] No [ ] I don't own property
6. Do you or does anyone in your family work for the oil and gas industry?
   [ ] Yes [ ] No
7. Do you have any additional comments regarding oil and gas development in Matagorda County?

_____

_____

For each statement regarding **nuclear energy** development, please indicate to what extent you agree or disagree by checking one of the boxes to the right:

Statements	Strongly Disagree	Mildly Disagree	Unsure	Mildly Agree	Strongly Agree
8. I consider myself knowledgeable about the **nuclear** industry.	□	□	□	□	□
9. I think the **nuclear** industry is a positive asset to Matagorda County.	□	□	□	□	□
10. I do not worry about the safety of the n**uclear** industry in Matagorda County.	□	□	□	□	□
11. I believe that **nuclear** energy is not harmful to the environment.	□	□	□	□	□

12. Do you or does anyone in your family work for the nuclear industry (South Texas Project nuclear plant or any other)?
    [ ] Yes [ ] No
13. Do you have any additional comments regarding nuclear energy in Matagorda County?

_____

_____

There was a recent plan to develop a coal-fired electric plant in Matagorda County which was eventually cancelled. For each statement regarding **coal-fired energy** development, please indicate to what extent you agree or disagree by checking one of the boxes to the right:

Statements	Strongly Disagree	Mildly Disagree	Unsure	Mildly Agree	Strongly Agree
14. I consider myself knowledgeable about the **coal** industry.	□	□	□	□	□
15. I think the **coal** industry would have been a positive asset to Matagorda County.	□	□	□	□	□
16. I do not worry about the safety of the **coal** industry in Matagorda County.	□	□	□	□	□
17. I believe that the **coal** industry is not harmful to the environment.	□	□	□	□	□

18. Do you or does anyone in your family work for the coal industry?
[ ] Yes [ ] No
19. Do you have any additional comments regarding the coal industry in Matagorda County?

_____

_____

Oil and gas, nuclear, and coal are considered to be conventional types of energy. In an effort to become less reliant on imported energy there is growing interest in alternative types of energies, especially renewable energies. The Gulf Coast has been proposed as an ideal spot for some types of alternative energy development. **The following sets of questions concern alternative types of energy development.**
For each statement regarding **wind energy** development, please indicate to what extent you agree or disagree by checking one of the boxes to the right:

Statements	Strongly Disagree	Mildly Disagree	Unsure	Mildly Agree	Strongly Agree
20. I consider myself knowledgeable about **wind energy**.	□	□	□	□	□
21. I think **wind energy** could be an asset to Matagorda County.	□	□	□	□	□
22. I do not worry about the safety of **wind energy** development in Matagorda County.	□	□	□	□	□
23. I believe that **wind energy** is not harmful to the environment.	□	□	□	□	□

24. Do you or does anyone in your family work in the wind energy industry?
[ ] Yes [ ] No
25. Do you have any wind energy development on your property in Matagorda County or elsewhere?
[ ] Yes [ ] No [ ] I don't own property
26. Do you have any additional comments regarding wind energy in Matagorda County?

_____

_____

For each statement regarding **solar energy** development, please indicate to what extent you agree or disagree by checking one of the boxes to the right:

Statements		Strongly Disagree	Mildly Disagree	Unsure	Mildly Agree	Strongly Agree
27.	I consider myself knowledgeable about **solar energy**.	□	□	□	□	□
28.	I think **solar energy** could be an asset to Matagorda County.	□	□	□	□	□
29.	I do not worry about the safety of **solar energy** development in Matagorda County.	□	□	□	□	□
30.	I believe that **solar energy** is not harmful to the environment.	□	□	□	□	□

31. Do you or does anyone in your family work in the solar energy industry?
    [ ] Yes [ ] No
32. Do you have any solar energy development on your property in Matagorda County or elsewhere?
    [ ] Yes [ ] No [ ] I don't own property
33. Do you have any additional comments about solar energy development in Matagorda County?

_____

_____

This set of questions concerns your perceptions about whether or not you feel that you have any input into what types of energy development will occur in Matagorda County.

34. Matagorda County has had a nuclear power plant (the South Texas Project) for over 30 years. If you lived in Matagorda County before the South Texas Project nuclear plant was built, did you feel you had any input as to whether or not the plant would be built in Matagorda County? (please check one)

    [ ] I felt as if I **DID NOT** have any input about building the plant in Matagorda County.
    [ ] I felt as if I **DID** have input about building the plant in Matagorda County.
    [ ] I do not recall.
    [ ] I did not live here or was too young at the time.

35. Have you ever been active in any community groups regarding energy development in Matagorda County?
    [ ] Yes [ ] No

36. If you answered YES to the above question (#35), were you in favor of or opposed to new energy development?
    [ ] In favor of new development [ ] Opposed to new development

37. Would you be willing to be a part of a community group to discuss the possible development of new forms of renewable energy in Matagorda County if the situation ever arose?
    [ ] Yes [ ] No

SECTION B: This next section of the questionnaire concerns geothermal energy and your thoughts about the possible future development of this energy source.

For each statement regarding **geothermal energy** development, please indicate to what extent you agree or disagree by checking one of the boxes on the right. After that, please read the brief description of geothermal energy and then answer the next set of questions:

Statements	Strongly Disagree	Mildly Disagree	Unsure	Mildly Agree	Strongly Agree
1. I consider myself knowledgeable about **geothermal energy**.	□	□	□	□	□
2. **I** think **geothermal energy** could be an asset to Matagorda County.	□	□	□	□	□
3. I do not worry about the safety of **geothermal energy** development in Matagorda County.	□	□	□	□	□
4. I believe that **geothermal energy** is not harmful to the environment.	□	□	□	□	□

Brief Description of Geothermal Energy

The word geothermal comes from the Greek words *geo* (earth) and *therme* (heat); geothermal energy is literally, heat from within the Earth. The temperature of the earth varies by depth, but like a cave, remains at a fairly steady temperature throughout the year. The various depths and temperatures determine how the heat can be obtained and utilized. This variety of geothermal resources allows them to be used on both large and small scales. A utility can use the hot water and steam from geothermal reservoirs to drive generators and produce electricity for its customers.

Low-temperature geothermal energy is defined as heat obtained from the geothermal fluid in the ground at temperatures of 300°F (150°C) or less. These resources are typically used in direct-use applications, such as district heating (heating buildings or districts, either individually or whole towns), greenhouses, fisheries, mineral recovery, and industrial process heating.

The map on the cover of this questionnaire shows the geothermal resources of the United States. Notice that several areas of Texas, including the Gulf Coast, have potential for low-temperature geothermal energy production. Another potential possibility in Texas is co-production of geothermal energy with existing oil and gas wells, and the possible utilization of abandoned wells. This hot geothermal fluid byproduct of many oil and gas wells was considered an inconvenience in the past, but it is now being looked at as a resource to produce electricity for field use or to be sold to the grid. Research is currently being done to determine the economic and ecological feasibility of this type of energy development.

Now that you have read the brief description of geothermal energy, please answer the following questions again, to indicate to what extent you may or may not have changed your opinion about each of the previous statements. Please indicate to what extent you agree or disagree by checking one of the boxes on the right.

Statements	Strongly Disagree	Mildly Disagree	Unsure	Mildly Agree	Strongly Agree
5. I consider myself knowledgeable about **geothermal energy**.	□	□	□	□	□
6. I think **geothermal energy** could be an asset to Matagorda County.	□	□	□	□	□
7. I do not worry about the safety of **geothermal energy** development in Matagorda County.	□	□	□	□	□
8. I believe that **geothermal energy** is not harmful to the environment.	□	□	□	□	□

This section concerns your opinions about the BENEFITS of geothermal energy:

9. Please read the following four (4) statements and rank them from 1 to 4 in order of which benefits of geothermal energy are most appealing to you, with "1" meaning **MOST APPEALING** and "4" meaning **LEAST APPEALING:**

   a. [ ] Geothermal energy offers a secure form of energy – it reduces our dependence on foreign oil; since the infrastructure is underground it is less susceptible to natural disaster or attack; and it is not dependent on weather conditions, so it can produce power 24 hours a day, 365 days per year.

   b. [ ] Geothermal energy emits almost no pollution; its use can result in reduced reliance on fossil fuels; and its power stations have a much smaller impact on the surrounding environment than other forms of energy production.

   c. [ ] While geothermal resources have been used in some form by people for centuries, the technological utilization of low-temperature geothermal energy as a renewable energy source is a recent and innovative development.

   d. [ ] Development of geothermal energy is a fast growing technology with new and emerging opportunities for business development and possible financial gain.

10. Please read the following two (2) statements and rank them 1 or 2, depending on which is most important to you, with "1" meaning **MOST IMPORTANT** and "2" meaning **NOT AS IMPORTANT:**

    a. [ ] Geothermal energy does not contribute to pollution; it is cleaner, and more efficient than burning fossil fuels.

    b. [ ] Geothermal energy uses the heat beneath our feet; with the right technology it is ours for the taking and, therefore, it should be more widely developed.

Section C: This next set of items deals with general environmental issues.

Please read each statement about the relationship between humans and the environment.
For each statement, indicate to what extent you agree or disagree by checking the box to the right **THAT BEST REPRESENTS YOUR OPINION.**

Statements	Strongly Disagree 1	Mildly Disagree 2	Unsure 3	Mildly Agree 4	Strongly Agree 5
1. We are approaching the limit of the number of people the earth can support.	☐	☐	☐	☐	☐
2. Humans have the right to modify the natural environment to suit their needs.	☐	☐	☐	☐	☐
3. When humans interfere with nature it often produces disastrous consequences.	☐	☐	☐	☐	☐
4. Human ingenuity will insure that we do NOT make the earth unlivable.	☐	☐	☐	☐	☐
5. Humans are severely abusing the environment.	☐	☐	☐	☐	☐
6. The earth has plenty of natural resources if we just learn how to develop them.	☐	☐	☐	☐	☐
7. Plants and animals have as much right as humans to exist.	☐	☐	☐	☐	☐
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.	☐	☐	☐	☐	☐
9. Despite our special abilities humans are still subject to the laws of nature.	☐	☐	☐	☐	☐
10. The so-called “ecological crisis” facing humankind has been greatly exaggerated.	☐	☐	☐	☐	☐
11. The earth is like a spaceship with very limited room and resources.	☐	☐	☐	☐	☐
12. Humans were meant to rule over the rest of nature.	☐	☐	☐	☐	☐
13. The balance of nature is very delicate and easily upset.	☐	☐	☐	☐	☐
14. Humans will eventually learn enough about how nature works to be able to control it.	☐	☐	☐	☐	☐
15. If things continue on their present course, we will soon experience a major ecological catastrophe.	☐	☐	☐	☐	☐

Section D: This next set of items concerns things that may be important to you as an individual. While these questions are not directly related to energy development, the results will be used in developing guidelines that will help communities lessen the conflict that often occurs when considering new energy development

Each statement briefly describes a person. Please read each description and think about ***HOW MUCH EACH PERSON IS OR IS NOT LIKE YOU*** and then check the box to the right that best represents your opinion about how much the person in the description is like you. Check only one box for each item.

HOW MUCH LIKE YOU IS THIS PERSON?	**Not like me at all**	**Not like me**	**A little like me**	**Moderately like me**	**Like me**	**Very much like me**
1. It is important to him or her that his/her country is secure and stable.	☐	☐	☐	☐	☐	☐
2. It is important to him or her to have a good time.	☐	☐	☐	☐	☐	☐
3. It is important to him or her to avoid upsetting other people.	☐	☐	☐	☐	☐	☐
4. It is important to him or her that the weak and vulnerable in society be protected.	☐	☐	☐	☐	☐	☐
5. It is important to him or her to care for nature.	☐	☐	☐	☐	☐	☐
6. It is important to him or her always to look for different things to do.	☐	☐	☐	☐	☐	☐
7. It is important to him or her to take care of people he/she is close to.	☐	☐	☐	☐	☐	☐
8. It is important to him or her to have the power that money can bring.	☐	☐	☐	☐	☐	☐
9. It is important to him or her to be tolerant toward all kinds of people and groups.	☐	☐	☐	☐	☐	☐
10. It is important to him or her to make his/her own decisions about his/her life.	☐	☐	☐	☐	☐	☐
11. It is important to him or her to maintain traditional values and ways of thinking.	☐	☐	☐	☐	☐	☐
12. It is important to him or her that people he/she knows have full confidence in him/her.	☐	☐	☐	☐	☐	☐
13. It is important to him or her to develop his/her own opinions.	☐	☐	☐	☐	☐	☐
14. It is important to him or her to help the people dear to him/her.	☐	☐	☐	☐	☐	☐
15. It is important to him or her to be personally safe and secure.	☐	☐	☐	☐	☐	☐
16. It is important to him or her to be a dependable and trustworthy friend.	☐	☐	☐	☐	☐	☐
17. It is important to him or her to have the power to make people do what he/she wants.	☐	☐	☐	☐	☐	☐
18. It is important to him or her to follow rules even when no-one is watching.	☐	☐	☐	☐	☐	☐

HOW MUCH LIKE YOU IS THIS PERSON?	Not like me at all	Not like me	A little like me	Moderately like me	Like me	Very much like me
19. It is important to him or her to be very successful.	☐	☐	☐	☐	☐	☐
20. It is important to him or her to follow his/her family's customs or the customs of a religion.	☐	☐	☐	☐	☐	☐
21. It is important to him or her to figure things out him/herself.	☐	☐	☐	☐	☐	☐
22. It is important to him or her to be the one who tells others what to do.	☐	☐	☐	☐	☐	☐
23. It is important to him or her to obey all the laws.	☐	☐	☐	☐	☐	☐
24. It is important to him or her to have all sorts of new experiences.	☐	☐	☐	☐	☐	☐
25. It is important to him or her to own expensive things that show his/her wealth.	☐	☐	☐	☐	☐	☐
26. It is important to him or her to protect the natural environment from destruction or pollution.	☐	☐	☐	☐	☐	☐
27. It is important to him or her to take advantage of every opportunity to have fun.	☐	☐	☐	☐	☐	☐
28. It is important to him or her that people recognize what he/she achieves.	☐	☐	☐	☐	☐	☐
29. It is important to him or her that his/her country protect itself against all threats.	☐	☐	☐	☐	☐	☐
30. It is important to him or her to never make other people angry.	☐	☐	☐	☐	☐	☐
31. It is important to him or her that everyone be treated justly, even people he/she doesn't know.	☐	☐	☐	☐	☐	☐
32. It is important to him or her to avoid anything dangerous.	☐	☐	☐	☐	☐	☐
33. It is important to him or her to be free to choose what he/she does by him/herself.	☐	☐	☐	☐	☐	☐
34. It is important to him or her to accept people even when he/she disagrees with them.	☐	☐	☐	☐	☐	☐

SECTION E: Finally, we need to ask some questions about you and your household. This information, as with all information provided in this questionnaire, will be used for statistical analysis only and will remain confidential.

1. What is your sex? [ ] Male [ ] Female

2. In what year were you born? _____

3. What is the highest level of education you have completed? (please check one)
   a) [ ] Elementary School
   b) [ ] High School Graduate or GED
   c) [ ] Military/Trade School
   d) [ ] Some College
   e) [ ] College Graduate
   f) [ ] Master's Degree
   g) [ ] Ph.D.
   h) [ ] Professional (law, medicine, veterinarian)

4. What is your occupation? _____

5. Which of the following best describes your current work situation? (please check one)
   a) [ ] Employed full-time
   b) [ ] Self employed
   c) [ ] Employed part-time
   d) [ ] Not employed, but looking for work
   e) [ ] Not employed, not looking for work
   f) [ ] Retired
   g) [ ] Other _____

6. What was the total income of your household (before taxes) last year? (please check one)
   a) [ ] Less than $15,000
   b) [ ] $15,000 to $24,999
   c) [ ] $25,000 to $34,999
   d) [ ] $35,000 to $44,999
   e) [ ] $45,000 to $74,999
   f) [ ] $75,000 to $99,999
   g) [ ] $100,000 or more

7. What race do you consider yourself? (please check one)
   a) [ ] American Indian
   b) [ ] Asian
   c) [ ] Black or African American
   d) [ ] Hispanic
   e) [ ] White
   f) [ ] Other (*please specify*)_____

8. Do you own property in Matagorda County? [ ] Yes [ ] No

9. Do you have any forms of alternative or renewable energy generation on your property in Matagorda County or elsewhere?
   [ ] Yes [ ] No If yes, what: _____

*You have now completed the survey. **THANK YOU** very much for your time and effort!*
If you wish to make any additional comments, please use the back cover.

You may use this back cover for any additional comments:

Please return the completed questionnaire in the included return envelope as soon as possible.
Thank you!

If you have any questions, please contact Marian Higgins, Texas A&M University
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